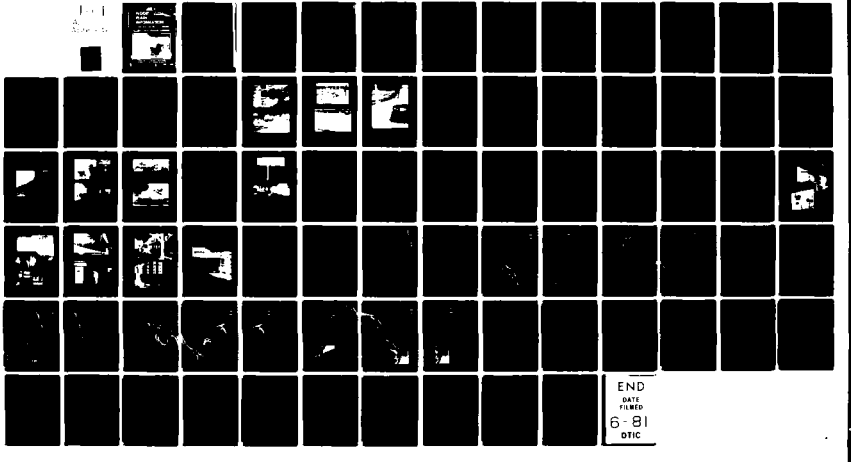
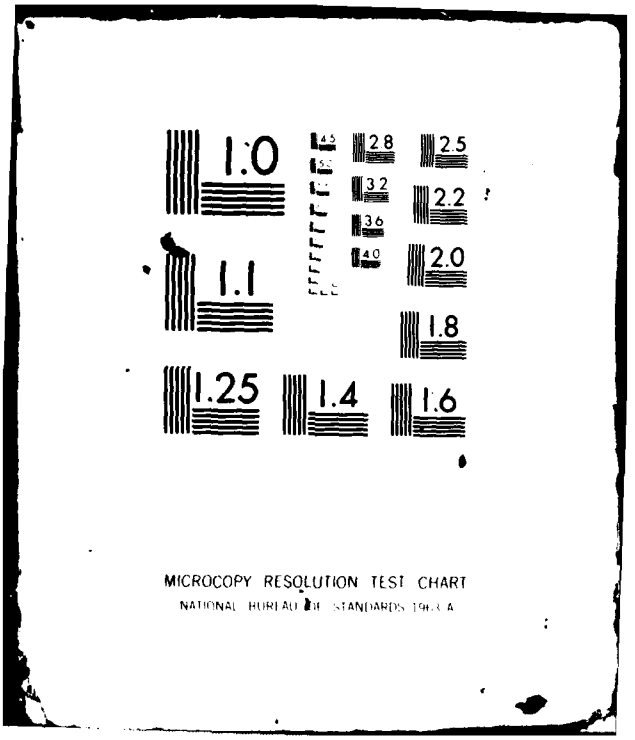
AD-A099 846 ARMY ENGINEER DISTRICT PHILADELPHIA PA F/G 8/8
FLOOD PLAIN INFORMATION, LITTLE LEHIGH CREEK, CEDAR CREEK, LITT--ETC(U)
OCT 72
UNCLASSIFIED DAEN/NAP-82040/FPI02-72/1 NL




1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963 A

AD A099846

...AIN INFORMATIO...

ALLENTOWN, PENNSY...

TO THE REQUESTOR:

This Flood Plain Information (FPI) Report was prepared by the Philadelphia District office of the U.S. Army Corps of Engineers, under the continuing authority of the 1960 Flood Control Act, as amended. The report contains valuable background information, discussion of flood characteristics and historical flood data for the study area. The report also presents through tables, profiles, maps and text, the results of engineering studies to determine the possible magnitude and extent of future floods, because knowledge of flood potential and flood hazards is important in land use planning and for management decisions concerning floodplain utilization. These projections of possible flood events and their frequency of occurrence were based on conditions in the study area at the time the report was prepared.

Since the publication of this FPI Report, other engineering studies or reports may have been published for the area. Among these are Flood Insurance Studies prepared by the Federal Insurance Administration of the Federal Emergency Management Agency, Flood Insurance Studies generally provide different types of flood hazard data (including information pertinent to setting flood insurance rates) and different types of floodplain mapping for regulatory purposes and in some cases provide updated technical data based on recent flood events or changes in the study area that may have occurred since the publication of this report.

It is strongly suggested that, where available, Flood Insurance Studies and other sources of flood hazard data be sought out for the additional, and, in some cases, updated flood plain information which they might provide. Should you have any questions concerning the preparation of, or data contained in this FPI Report, please contact:

U.S. Army Corps of Engineers
Philadelphia District
Custom House, 2nd and Chestnut Streets
Philadelphia, PA 19106

ATTN: Flood Plain Mgt. Services Branch, NAPEN-M

Telephone number: (215) 597-4807

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: DAEN/NAP-82040/FPI02-72/10	2. GOVT ACCESSION NO.: AD-A099 846
3. RECIPIENT'S CATALOG NUMBER:	
4. TITLE (and Subtitle): Flood plain information Allentown, Pa., Little Lehigh Creek, Cedar Creek, Little Cedar Creek	5. TYPE OF REPORT & PERIOD COVERED: Flood plain information
	6. PERFORMING ORG. REPORT NUMBER: DAEN/NAP-82040/FPI02-72/10
7. AUTHOR(s):	8. CONTRACT OR GRANT NUMBER(s):
9. PERFORMING ORGANIZATION NAME AND ADDRESS: U.S. Army Engineer District Philadelphia, 2nd & Chestnut Sts., Philadelphia, PA 19106	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS:
11. CONTROLLING OFFICE NAME AND ADDRESS: U.S. Army Engineer District Philadelphia, 2nd & Chestnut Sts., Philadelphia, PA 19106	12. REPORT DATE: Oct 1972
	13. NUMBER OF PAGES: 60
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	15. SECURITY CLASS. (of this report): UNCLASSIFIED
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE:

16. DISTRIBUTION STATEMENT (of this Report)

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Allentown, Pa.
Little Lehigh Creek, Pa.
Cedar Creek, Pa.
Little Cedar Creek, Pa.
Floods
Flood forecasting
Flood plains

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The portion of the City of Allentown, Pa. covered by this report (the second of 2 reports) is subject to flooding from Little Lehigh Creek, Cedar Creek and Little Cedar Creek. At the time of this report this area was primarily undeveloped or park lands.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

This report includes a history of flooding in Allentown, Pa. along these particular creeks and identifies areas subject to possible future floods. It also presents thru tables, profiles, maps and text the results of engineering studies to determine the possible magnitude of future flooding from the time of the report date.

Under authority of Section 206 of 1960 Flood Control Act as amended this report was prepared with governmental monies by the U.S. Army Corps of Engineers Philadelphia District. The information contained within the report should be considered of an historical nature. Since the publication of this FPI report, other flood insurance studies have been published and should be consulted.

INSTRUCTIONS FOR PREPARATION OF REPORT DOCUMENTATION PAGE

RESPONSIBILITY. The controlling DoD office will be responsible for completion of the Report Documentation Page, DD Form 1473, in all technical reports prepared by or for DoD organizations.

CLASSIFICATION. Since this Report Documentation Page, DD Form 1473, is used in preparing announcements, bibliographies, and data banks, it should be unclassified if possible. If a classification is required, identify the classified items on the page by the appropriate symbol.

COMPLETION GUIDE

General. Make Blocks 1, 4, 5, 6, 7, 11, 13, 15, and 16 agree with the corresponding information on the report cover. Leave Blocks 2 and 3 blank.

Block 1. Report Number. Enter the unique alphanumeric report number shown on the cover.

Block 2. Government Accession No. Leave Blank. This space is for use by the Defense Documentation Center.

Block 3. Recipient's Catalog Number. Leave blank. This space is for the use of the report recipient to assist in future retrieval of the document.

Block 4. Title and Subtitle. Enter the title in all capital letters exactly as it appears on the publication. Titles should be unclassified whenever possible. Write out the English equivalent for Greek letters and mathematical symbols in the title *(see "Abstracting Scientific and Technical Reports of Defense-sponsored RDT/E," AD-667 000)*. If the report has a subtitle, this subtitle should follow the main title, be separated by a comma or semicolon if appropriate, and be initially capitalized. If a publication has a title in a foreign language, translate the title into English and follow the English translation with the title in the original language. Make every effort to simplify the title before publication.

Block 5. Type of Report and Period Covered. Indicate here whether report is interim, final, etc., and, if applicable, inclusive dates of period covered, such as the life of a contract covered in a final contractor report.

Block 6. Performing Organization Report Number. Only numbers other than the official report number shown in Block 1, such as series numbers for in-house reports or a contractor/grantee number assigned by him, will be placed in this space. If no such numbers are used, leave this space blank.

Block 7. Author*(s)*. Include corresponding information from the report cover. Give the name*(s)* of the author*(s)* in conventional order *(for example, John R. Doe or, if author prefers, J. Robert Doe)*. In addition, list the affiliation of an author if it differs from that of the performing organization.

Block 8. Contract or Grant Number*(s)*. For a contractor or grantee report, enter the complete contract or grant number*(s)* under which the work reported was accomplished. Leave blank in in-house reports.

Block 9. Performing Organization Name and Address. For in-house reports enter the name and address, including office symbol, of the performing activity. For contractor or grantee reports enter the name and address of the contractor or grantee who prepared the report and identify the appropriate corporate division, school, laboratory, etc., of the author. List city, state, and ZIP Code.

Block 10. Program Element, Project, Task Area, and Work Unit Numbers. Enter here the number code from the applicable Department of Defense form, such as the DD Form 1498, "Research and Technology Work Unit Summary" or the DD Form 1634, "Research and Development Planning Summary," which identifies the program element, project, task area, and work unit or equivalent under which the work was authorized.

Block 11. Controlling Office Name and Address. Enter the full, official name and address, including office symbol, of the controlling office. *(Equates to funding/sponsoring agency. For definition see DoD Directive 5200.20, "Distribution Statements on Technical Documents.")*

Block 12. Report Date. Enter here the day, month, and year or month and year as shown on the cover.

Block 13. Number of Pages. Enter the total number of pages.

Block 14. Monitoring Agency Name and Address *(if different from Controlling Office)*. For use when the controlling or funding office does not directly administer a project, contract, or grant, but delegates the administrative responsibility to another organization.

Blocks 15 & 15a. Security Classification of the Report: Declassification/Downgrading Schedule of the Report. Enter in 15 the highest classification of the report. If appropriate, enter in 15a the declassification/downgrading schedule of the report, using the abbreviations for declassification/downgrading schedules listed in paragraph 4-207 of DoD 5200.1-R.

Block 16. Distribution Statement of the Report. Insert here the applicable distribution statement of the report from DoD Directive 5200.20, "Distribution Statements on Technical Documents."

Block 17. Distribution Statement *(of the abstract entered in Block 20, if different from the distribution statement of the report)*. Insert here the applicable distribution statement of the abstract from DoD Directive 5200.20, "Distribution Statements on Technical Documents."

Block 18. Supplementary Notes. Enter information not included elsewhere but useful, such as: Prepared in cooperation with . . . Translation of *(or by)* . . . Presented at conference of . . . To be published in . . .

Block 19. Key Words. Select terms or short phrases that identify the principal subjects covered in the report, and are sufficiently specific and precise to be used as index entries for cataloging, conforming to standard terminology. The DoD "Thesaurus of Engineering and Scientific Terms" *(TEST)*, AD-672 000, can be helpful.

Block 20. Abstract. The abstract should be a brief *(not to exceed 200 words)* factual summary of the most significant information contained in the report. If possible, the abstract of a classified report should be unclassified and the abstract to an unclassified report should consist of publicly- releasable information. If the report contains a significant bibliography or literature survey, mention it here. For information on preparing abstracts see "Abstracting Scientific and Technical Reports of Defense-Sponsored RDT&E," AD-667 000.

★ U.S. GPO: 1974—540-847/9052

CONTENTS

CONTENTS (Continued)

TABLES

CONTENTS (Continued)

PLATES

FIGURES

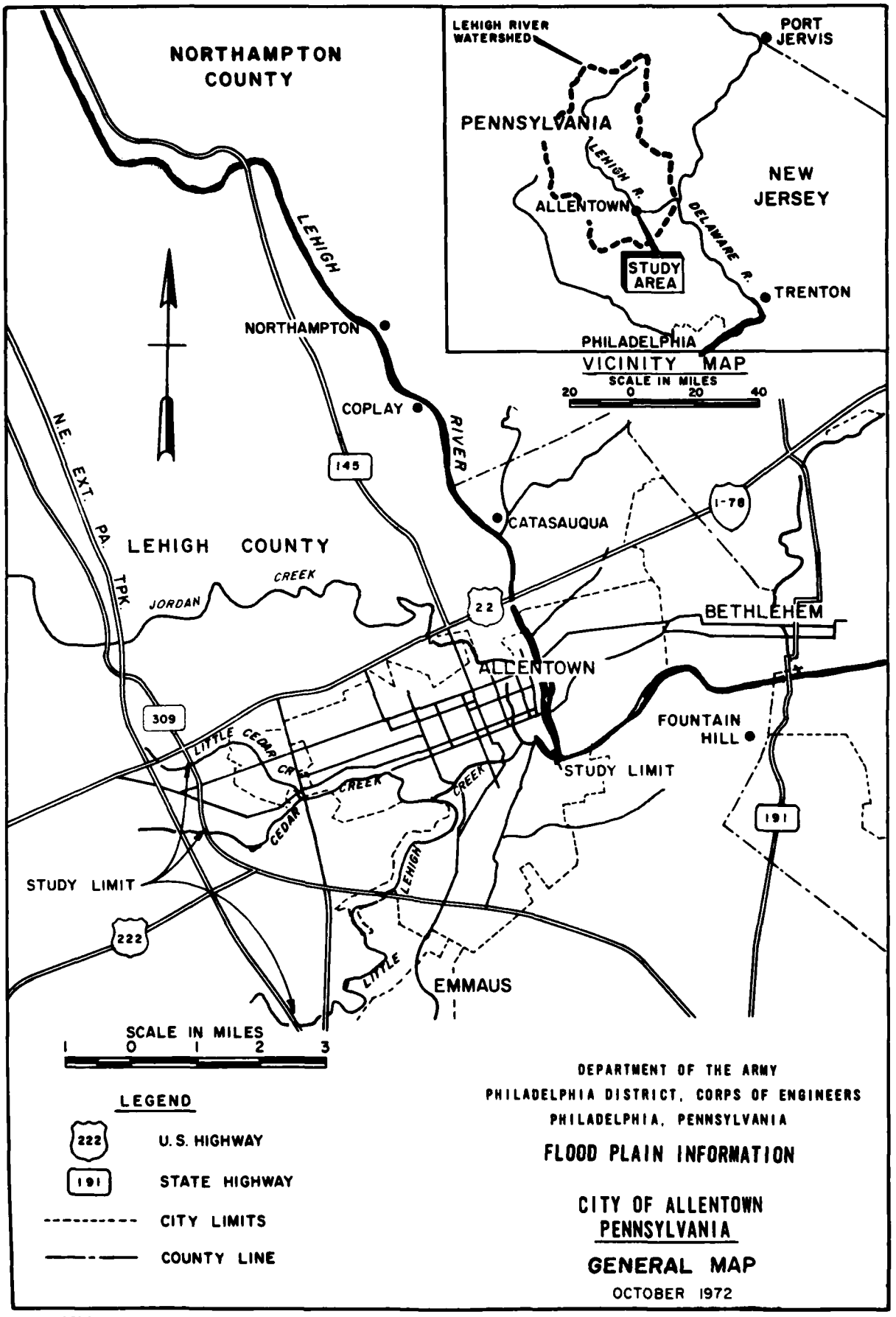

NORTHAMPTON COUNTY
LEHIGH RIVER WATERSHED
PORT JERVIS
PENNSYLVANIA
LEHIGH R.
NEW JERSEY
ALLENTOWN
DELAWARE R.
STUDY AREA
TRENTON
PHILADELPHIA
VICINITY MAP
SCALE IN MILES
20 0 20 40
LEHIGH
NORTHAMPTON
COPLAY
RIVER
145
N.E. EXT. PA. TPK.
LEHIGH COUNTY
CATASAUQUA
I-78
JORDAN CREEK
22
BETHLEHEM
ALLENTOWN
309
LITTLE CEDAR CR.
CREEK
CEDAR CREEK
FOUNTAIN HILL
STUDY LIMIT
191
STUDY LIMIT
LEHIGH
222
LITTLE
EMMAUS
SCALE IN MILES
1 0 1 2 3
LEGEND
222 U.S. HIGHWAY
191 STATE HIGHWAY
CITY LIMITS
COUNTY LINE
DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA
FLOOD PLAIN INFORMATION
CITY OF ALLENTOWN
PENNSYLVANIA
GENERAL MAP
OCTOBER 1972

PLATE 1

PREFACE

The portion of the City of Allentown covered by this report, the second of two reports, is subject to flooding from Little Lehigh Creek, Cedar Creek, and Little Cedar Creek. The properties along these streams are primarily undeveloped or park lands; however, residential, commercial, and industrial properties in the area have been severely damaged by the floods of 1839, 1902, 1942, 1955, and 1972. The open spaces which may come under pressure for future development are extensive. Although large floods have occurred in the past, studies indicate that even larger floods are possible.

This report has been prepared because a knowledge of flood potential and flood hazards is important in land use planning and for management decisions concerning flood plain utilization. It includes a history of flooding in Allentown along Little Lehigh Creek, Cedar Creek, and Little Cedar Creek and identifies those areas that are subject to possible future floods. Special emphasis is given to these possible future floods through maps, photographs, profiles, and cross sections. The report does not provide solutions to flood problems; however, it does furnish a suitable basis for the adoption of land use controls to guide flood plain development and thereby prevent intensification of the loss problems. It will also aid in the identification of areas where other flood damage reduction techniques such as works to modify flooding and adjustments including flood proofing might be embodied in an overall flood plain management (FPM) program. Other FPM program studies--those of environmental attributes and the current and future land use role of the flood plain as part of its surroundings--would also profit from this information.

At the request of the Allentown City Planning Commission and endorsement of the Pennsylvania Department of Environmental Resources, this report was prepared by the Philadelphia District Office of the U.S. Army Corps of Engineers under the continuing authority provided in Section 206 of the 1960 Flood Control Act, as amended.

Assistance and cooperation of the U.S. Geological Survey (U.S.G.S.), Allentown City Planning Commission, Allentown Department of Parks, and private citizens in supplying useful data and photographs for the preparation of this report are appreciated.

Additional copies of this report can be obtained from the Allentown City Planning Commission. The Corps of Engineers, Philadelphia District Office, upon request, will provide technical assistance to planning agencies in the interpretation and use of the data presented as well as planning guidance and further assistance, including the development of additional technical information.

BACKGROUND INFORMATION

Settlement

In 1762, Judge William Allen established "Northampton Town," renamed Allentown in 1811, on a large tract of land that he had purchased 27 years earlier. The fairly-level terrain, beautifully situated within the confluence of three streams, made an ideal site for this new community. The stream, now called Little Lehigh Creek, flowed to the south of the town tract, and coming in from the west and north were Cedar Creek and Jordan Creek.

The small agriculturally-oriented community developed slowly, and oddly, the first industries were thrust upon it during the Revolutionary War. These industries were moved from Philadelphia to protect them from the British. After the war, the high cost of transportation by land and the long wait for supplies made it necessary for the people of Allentown to develop their own industrial capabilities.

The streams in Allentown played an important role in its early industrial development because they provided the pure water and power that was necessary for industrial operations. By 1814, many mills and factories had sprung up on the flood plains. The discovery of iron and coal was the actual foundation for the city's industrial development, but these natural resources could not be utilized until the initiation of a transportation system by water. In 1798, the Lehigh Navigation Company was formed to develop transportation on the river. Later, in 1827, work was started on the construction of the Lehigh Canal which was to prove a major factor in the transportation of freight in this area until early in the twentieth century.

At the present time, although the streams have lost their importance for transportation and industrial operations, several industries remain on the flood plain. Development can be expected to increase as existing industries expand and redevelopment of flood plain land by the City of Allentown is already in progress. Expansion of the city's suburban communities will put additional flood plain areas under increasing pressure for development.

The Stream and Its Valley

Little Lehigh Creek originates in the low hills of Longswamp Township, Berks County, and flows northeasterly through Lehigh County to its confluence with the Lehigh River in the City of Allentown. Portions of the 188 square mile drainage area along the upper reach of Little Lehigh Creek are devoted to agriculture with some small interspersed com-

munities. Further downstream, the watershed is composed of residential development, municipal park land, and urbanized portions of Allentown. In its 9.4 mile study reach, Little Lehigh Creek meanders through relatively steep terrain and narrow flood plains which slope gently to low stream banks. The stream channel falls approximately 92 feet for an average slope of 9.8 feet per mile. The channel has very little vegetation while overbank areas are covered with short grass and varying amounts of tree cover.

Cedar Creek originates in Lower Macungie Township, Lehigh County, and flows easterly to its confluence with Little Lehigh Creek in Allentown. With a total drainage area of 15 square miles, Cedar Creek flows through gently-rolling farm land at its headwaters and then through park land and urbanized areas of Allentown before emptying into Little Lehigh Creek. The stream channel slopes an average of 20 feet per mile and splits in several locations to form small islands.

Little Cedar Creek has its headwaters in South Whitehall Township, Lehigh County, and flows eastward 2.2 miles through rolling terrain to its confluence with Cedar Creek, east of Cedar Crest Boulevard. The stream channel slopes approximately 40 feet per mile and has very little vegetation. Overbank areas, including the municipal golf course and park lands, are covered by short grass and scattered trees. Drainage areas contributing to runoff at locations in or near the study areas of Little Lehigh Creek, Cedar Creek, and Little Cedar Creek are shown in Table 1.

The climate of the area is characterized by moderately warm summers, when temperatures may rise about 85 degrees, and cool winters, when temperatures reach below 20 degrees with an average annual temperature of 50 degrees. Annual precipitation over the basin averages 42 inches per year with a major portion occurring through late spring and early fall. Seasonal snowfall averages 34 inches a year. The valley is susceptible to torrential rains that cause rivers and creeks to rise rapidly, and also, snowmelt combined with normal spring rains, usually presents a threat of flooding in Allentown and the surrounding area.

TABLE 1
DRAINAGE AREAS

Location	Mileage Above Mouth	Drainage Area	
		Tributary sq. mi.	Total sq. mi.
Little Lehigh Creek			
At Confluence with Lehigh River	0	--	188.0
Trout Creek	0.45	8.0	---
Jordan Creek	0.64	81.0	179.9
Cedar Creek	2.61	15.0	95.9
U.S.G.S. Gage	3.41	---	80.8
Leibert Run	9.14	6.3	73.7
At Upper End of Study	9.39	---	67.3

TABLE 1 (Continued)
DRAINAGE AREAS

Location	Mileage Above Mouth	Drainage Area	
		Tributary sq. mi.	Total sq. mi.
Cedar Creek			
At Confluence with Little Lehigh Creek	0	---	15.0
Little Cedar Creek			
At Confluence with Cedar Creek	0	---	5.0

Developments in the Flood Plain

Within the study area, much of the flood plain of Little Lehigh Creek upstream from the confluence with Cedar Creek has been preserved as park land with many remaining areas utilized for farming. However, from the confluence of Cedar Creek downstream to the confluence with Jordan Creek and beyond to the Lehigh River, several residences and industries are located on the flood plain. Many old buildings on or near the flood plain in the vicinity of the Lehigh Street bridge have been razed in preparation for redevelopment of the area. In addition to the residential and industrial structures which remain, streets, railroads, and utilities, including a water filtration plant, are located on flood plain lands and are subject to flooding from Little Lehigh Creek.

Large portions of the flood plain of Cedar Creek and Little Cedar Creek have also been preserved for use as municipal park land, including a golf course (on Little Cedar Creek) and other recreation areas. Encroachments on remaining flood plain land include private residences, several commercial structures, and an amusement park on Cedar Creek, and residential structures including an apartment complex on Little Cedar Creek. As the population of the area increases, open space on or near the flood plain will come under increasing pressure for development. Table 2 gives population statistics for the Allentown area. These figures indicate suburban Allentown to be experiencing a higher growth rate than the city. In addition to structures on the flood plain, public utilities and transportation facilities may be subject to inundation by Cedar and Little Cedar Creeks.

A total of 11 dams are located in the study area covered by this report--4 on Little Lehigh Creek, 4 on Cedar Creek, and 3 on Little Cedar Creek. However, these dams are all of the low-flow type having no significant flood storage capacity.

TABLE 2
POPULATION OF LEHIGH COUNTY AND THE CITY OF ALLENTOWN

Lehigh County		City of Allentown	
Date	**Census**	**Date**	**Census**
1950	198,207	1950	106,576
1960	227,536	1960	108,347
1970	253,057	1970	108,926

FLOOD SITUATION

Sources of Data and Records

Precipitation records for Allentown, Pennsylvania, were obtained from the National Weather Service Branch of the National Oceanic and Atmospheric Administration (NOAA) which has maintained a recording gage at the Allentown-Bethlehem-Easton Airport since 1931. Streamflow records were obtained from a U.S. Geological Survey recording gage on Little Lehigh Creek, approximately 3.4 miles above the mouth, and 0.8 mile above the confluence of Cedar Creek. The period of record for this gage is from October 1945 to the present time.

To supplement the records at the gaging stations, newspaper files, historical documents and records were searched for information concerning past floods. Flood stages and elevations at various locations on Little Lehigh Creek, Cedar Creek, and Little Cedar Creek were obtained from the City Engineer of Allentown.

Maps prepared for this report were based on U.S. Geological Survey quadrangle sheets entitled "Allentown East, Pennsylvania," 1964 and "Allentown West, Pennsylvania," 1964. Structural data on bridges and culverts were obtained from field surveys performed by Corps of Engineers, Philadelphia District, personnel.

Flood Season and Flood Characteristics

Major floods have occurred in the study reaches of Little Lehigh Creek, Cedar Creek, and Little Cedar Creek during all seasons of the year. The largest amounts of precipitation occur during the summer months when the area is susceptible to heavy thunderstorms and the torrential rains associated with hurricanes that cause rivers and creeks to rise rapidly. The floods following the August 1955 hurricane and the May 1942 storm were the result of runoff from heavy rainfall over the general area. Snowmelt also presents a threat of flooding in the area, especially when combined with normal spring rains.

Flood stages on the Lehigh River produce a backwater effect that increases flood heights at the mouth of Little Lehigh Creek. In addition to greater depths of floodwaters, larger areas of the flood plain are inundated resulting in increased damage to surrounding development. In 1955 serious flooding occurred on Little Lehigh Creek because of the high stages on the Lehigh River.

Factors Affecting Flooding and Its Impact

Obstructions to floodflows - Obstructions to floodflows can be either natural or man-made. Natural obstructions that impede floodflows may be sharp bends in stream alignment, channel constrictions due to topography of adjacent terrain, shoaling, rock outcrops in the stream or on the flood plain, and vegetation such as grass, brush or trees. Photographs of representative natural obstructions may be found in Figures 1 and 2. As floodflow is impeded, the velocity of the water decreases and the depth of flow increases; this results in flooding along streams. Man-made obstructions include bridges, culverts, dams, docks, levees, and earthfills. These man-made obstructions may severely hamper flow and cause a backwater condition, which creates more flooding than normally would occur with only natural obstructions present.

During floods, trees, brush, and other debris may be washed downstream to collect on bridges and other obstructions to flow. As the floodflow increases, masses of debris break loose and a wall of water and debris surges downstream until another obstruction is encountered. Debris may collect against a bridge until the load exceeds its structural capacity and causes the bridge to fail. An example of debris deposited by receding floodwaters can be seen in Figure 3. Examples of debris collecting in bridge openings under normal streamflow can be seen in Figures 4 and 5.

Little Lehigh Creek, Cedar Creek, and Little Cedar Creek pass through 2 culverts and are spanned by 58 bridges. Pertinent information on all bridges and culverts can be found in Table 6 on Page 26. Many of these bridges are obstructive to floodflows. A total of 11 dams are located on Little Lehigh, Cedar, and Little Cedar Creeks, however, they have no flood control capacities nor will they seriously alter flow characteristics of floodwaters.

The limited capacity of obstructive bridges or culverts, debris plugs at bridge waterway openings or culvert mouths, or a combination of these factors cause flooding upstream, erosion around the culvert entrances and bridge approach embankments. This erosion can cause damage to the overlying roadbed. In general, obstructions restrict floodflows and result in overbank flows and unpredictable areas of flooding, destruction of or damage to bridges and culverts, and an increased velocity of flow immediately downstream. It is impossible to predict the degree or location of debris accumulation; therefore, in the development of flood profiles for this report, it was necessary to assume that there would be no accumulation of debris to clog any of the bridge or culvert openings.

Flood damage reduction measures - No works to modify flooding have been undertaken on Little Lehigh Creek, Cedar Creek, or Little Cedar Creek. However, flood plain ordinances have been adopted by the City of Allentown for limited portions of flood plain land. These ordinances will be updated and modified to include information contained in the Flood Plain Information Report prepared by the Corps of Engineers in September, 1971, which covered Lehigh River, Jordan and Trout Creeks, and by this report, which covers Little Lehigh Creek, Cedar and Little Cedar Creeks.

FIGURE 1. Trees and brush obstruct the flow of water in Cedar Creek upstream of the Mosser Street bridge

FIGURE 2. Shoaling and vegetation impede the flow of water in Cedar Creek under this bridge at the intersection of Cedar Crest Boulevard and Parkway Boulevard. The low underclearance of this bridge may also be restrictive to floodflows.

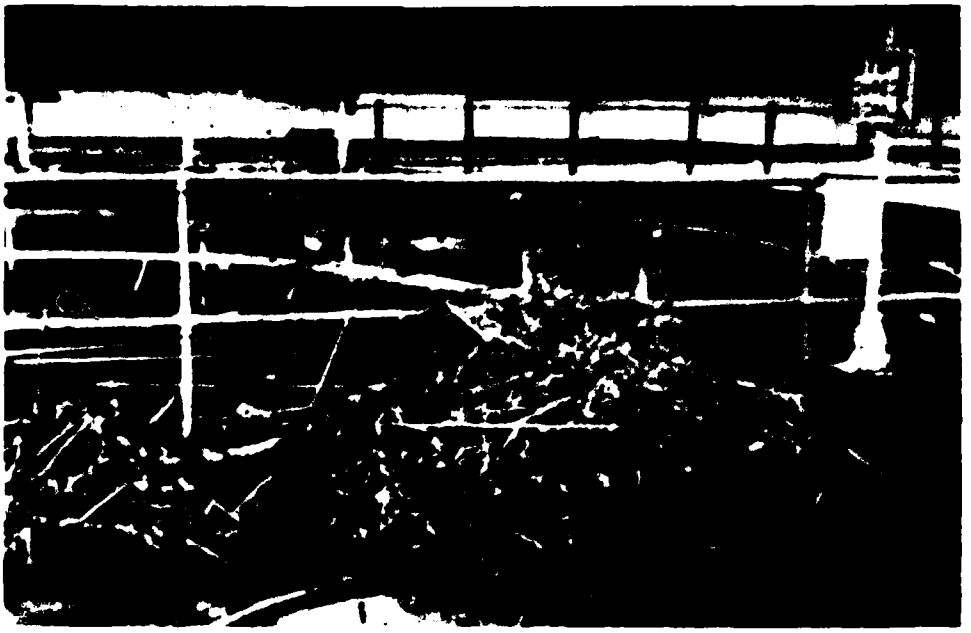


FIGURE 3-Debris deposited in Dorney Park by floodwaters of Cedar Creek during the flood of September 12, 1960. (Photograph courtesy of Dorney Park).

FIGURE 4-Accumulated debris in Little Lehigh Creek partially blocks the flow of water under this Lehigh Valley Railroad bridge at Lehigh Street. Note shoaling of the stream channel in the foreground.

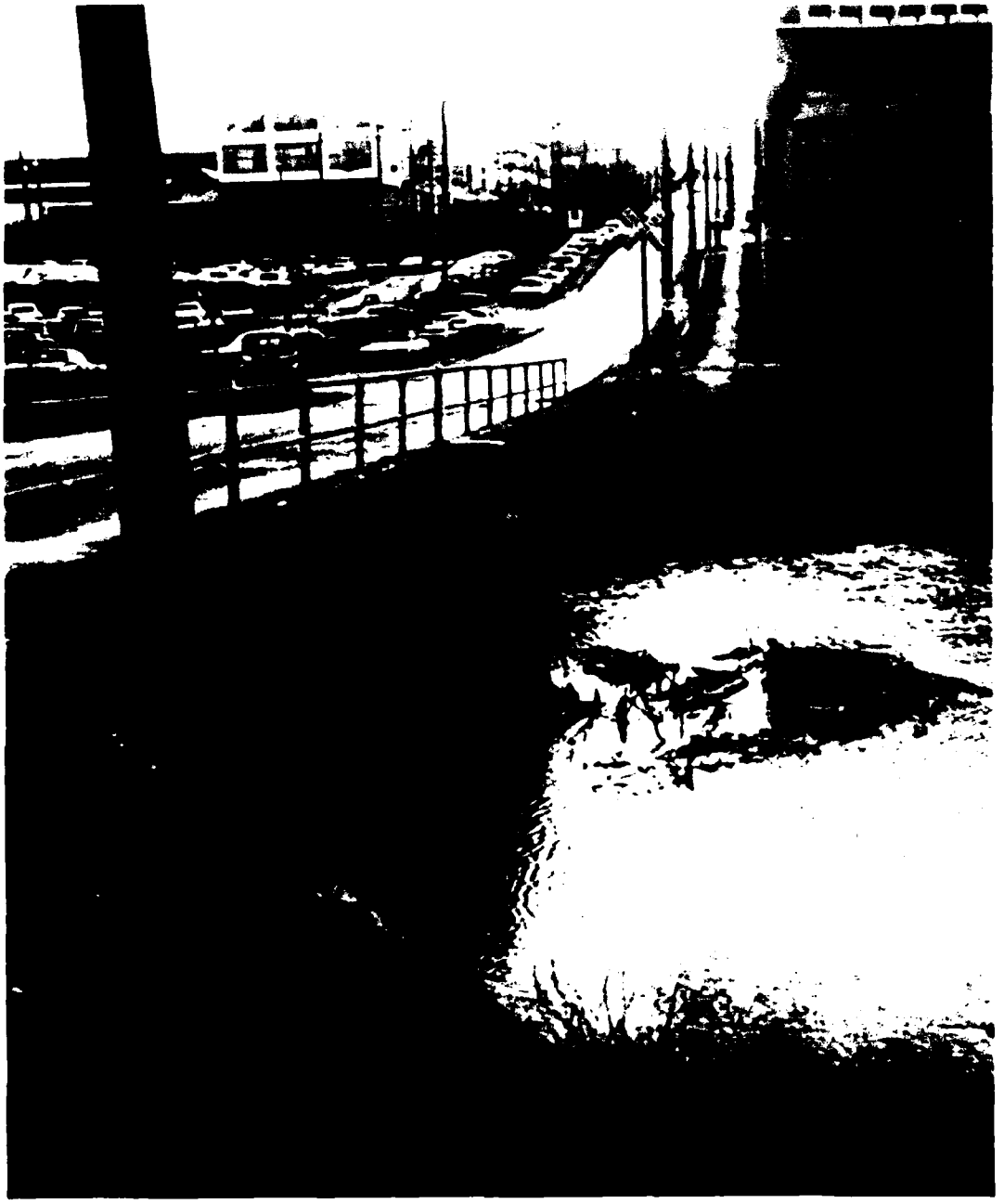


FIGURE 5-Debris accumulation in Little Lehigh Creek at the 10th Street bridge.

There are two U.S. Army Corps of Engineers' dams currently in operation in the Lehigh River Basin: Francis E. Walter Dam, located about 55 miles above Allentown, Pennsylvania, on the Lehigh River, and Beltzville Lake, located about 24 miles above Allentown on Pohopoco Creek, a tributary to the Lehigh River. These two projects are designed for low-flow augmentation and flood control, and by reducing flood stages of the Lehigh River, they can decrease the backwater effect that aggravates flooding at the mouth of Little Lehigh Creek. The Flood Control Act of 1962 authorized the construction of the Trexler Lake on Jordan Creek, which joins the Little Lehigh Creek. The project is currently in the design stage, but when completed and in operation, the dam will reduce flood stages in Jordan Creek and consequently also reduce flood stages in the lower reach of Little Lehigh Creek. Beltzville Lake and Trexler Lake will also be used for water supply.

Other factors and their impacts - The impact of flooding along Little Lehigh Creek, Cedar Creek, and Little Cedar Creek can be affected by the ability of local residents to anticipate and effectively react to a flood emergency. Efficient flood warning and forecasting systems can give home owners, business, and industry valuable time to remove damageable materials from low-lying areas. Increased damages to downstream areas can also be reduced if buoyant materials stored on the flood plain can be removed before being carried downstream to block bridge and culvert openings. Implementation of effective flood fighting and emergency evacuation plans can further reduce flood damages and the incidence of personal injury or death once the creek has reached flood stage.

Flood warning and forecasting - The National Oceanic and Atmospheric Administration (NOAA) maintains year-round surveillance of weather conditions at Allentown, Pennsylvania. Flood warnings and anticipated weather conditions are issued by the National Weather Service to city officials, radio and television stations, and local press media for further dissemination to residents in the area. Flood warning for the Little Lehigh Creek, Cedar Creek, and Little Cedar Creek within the City of Allentown is carried out by the Department of Operations and Public Safety working with Civil Defense agencies. When the National Weather Service forecasts that high water stages could be expected, observations of stream stages are made at strategic locations.

Flood fighting and emergency evacuation plans - Although there are no formal flood fighting or emergency evacuation plans for the Allentown area, provisions for alerting area residents and coordinating operations of city and county public service agencies in time of emergency are made through the Lehigh County Civil Defense Office. This office maintains communication with the State Civil Defense Headquarters National Weather Service at its control center and establishes a "flood watch" during the earliest stages of a flood threat. When the floodwaters reach a predetermined stage, Civil Defense telephone operators begin a systematic process of warning businesses and industries that are located in flood-prone areas. Subsequent flood fighting, evacuation, and rescue activities are coordinated on a county-wide basis with local public agencies.

Material storage on the flood plain - During past floods, buoyant materials and tanks stored on the flood plains of Little Lehigh Creek, Cedar Creek, and Little Cedar Creek created additional hazards. Today, although much of the flood plain is park land, there are several industries, namely a liquified gas company and a fertilizer company, that store floatable tanks on the flood plain. These tanks may present danger during periods of severe flooding if they are carried downstream to block bridge and culvert openings.

PAST FLOODS

Summary of Historical Floods

Floods that caused damage on Little Lehigh Creek, Cedar Creek, and Little Cedar Creek occurred in 1839, 1902, 1942, 1955, and 1972. Records of peak flows or stages were not available for the floods that occurred before 1945, but historic accounts reveal the most severe flood to be the flood of February 28, 1902. The second most severe flood occurred on May 24, 1942. These floods caused loss of life and great property damage. The other three floods caused damage of a much smaller magnitude. At the Little Lehigh Creek gaging station, the highest stage recorded was the flood of June 22, 1972.

Flow records from the gage on Little Lehigh Creek indicate peak flows and stages occurred in 1955, 1958, 1969, and 1972. The flood of 1955 caused damage near the mouth of Little Lehigh Creek, while moderate damage was attributed to the other three floods.

Flood Records

Peak flows and stages recorded by the U.S. Geological Survey Gage No. 4515, located on Little Lehigh Creek, were obtained from the U.S.G.S. Water Supply Paper No. 1672 entitled: *Magnitude and Frequency of Floods in the United States, Part 1-B, North Atlantic Slope Basins, New York to York River.* The flood records for this gage are found in Table 3. Descriptions of past floods were obtained at the Allentown City Library from a book entitled: *Anniversary History of Allentown, Pennsylvania, Volume 1, 1914.* Other flood descriptions were taken from the files of the following Allentown newspapers: *The Morning Call* and *The Call-Chronicle.* Locations or descriptions of high water marks were obtained from residents who lived along the stream and had a personal knowledge of past floods.

TABLE 3
FLOOD CREST ELEVATIONS
ELEVEN HIGHEST FLOODS RECORDED
LITTLE LEHIGH CREEK AT GAGE NEAR ALLENTOWN, PENNSYLVANIA[a]

Date of Crest	Estimated Peak Discharge cfs	Stage[b] ft.	Elevation ft.-m.s.l.d.
June 22, 1972	---	11.8	265.2
July 9, 1935[c]	---	9.5	262.9
July 28, 1969	3,020	7.7	261.1
February 28, 1958	1,960	6.3	259.7
August 18, 1955	1,880	6.2	259.6
October 15, 1955	1,530	5.5	258.9
March 6, 1963	1,530	5.4	258.8
August 18, 1946	1,300	5.1	258.5
February 8, 1965	1,290	5.0	258.4
February 27, 1962	1,270	5.0	258.4
September 12, 1960	830	4.4	257.8

(a) Gage has been in operation since October 1945.
(b) Gage datum is 253.41 feet, mean sea level datum; bankfull stage is 4.0 feet.
(c) Information furnished by the City of Allentown, Pa. (Flood Mark).

Flood Descriptions

Some of the early floodwaters on the Little Lehigh Creek rose to such great heights that graphic descriptions of the damage they caused were recorded in local history books. The following descriptions of floods on the Little Lehigh Creek were taken from one volume of a set of the following books:

EXCERPTS TAKEN FROM THE ANNIVERSARY HISTORY OF ALLENTOWN, PENNSYLVANIA, VOLUME 1 - 1914, RELATIVE TO THE FLOOD OF JANUARY 26, 1839

Floods

Flood of 1839 - An extraordinary flood occurred in the Lehigh and Little Lehigh on Saturday, Jan. 26, 1839. There was a hard, continuous rain during Friday and Saturday which caused all the streams in the vicinity of Allentown to rise to unusual heights, and by Saturday afternoon the waters of the river flooded a number of stores along the basin and caused much damage to the goods in the cellars. One of the piers of the bridge was injured, and the flood reached within two feet of the floor.

The Little Lehigh also overflowed its banks from Mertz's tannery to Engelman's tavern. All the land was under water and the bridge across the stream was only two feet above the surface. Nonnemacher and Savitz suffered much damage, and great quantities of wood was swept away from brick-kilns, and many unburned bricks were destroyed. Damage was done to Hunter's, Heimbach's, and Weaver's grist-mills, and to Ruhe's tobacco factory.

The dam and stable at Edelman's mills were washed away and the bridge across the creek was so damaged as to make it impassable. The bridges at Klein's and Danner's mills were also injured. Many families along the creek had to leave. Rails, lumber and other property were swept away, and all the bridges were more or less injured.

During the height of the flood on Saturday afternoon, a distressing accident occurred at the crossing of the Little Lehigh between the two mills, on the road to Emaus. The driver of the Philadelphia mail-coach, Henry Gaumer, was drowned in attempting to reach Allentown. . .

The flood of February 28, 1902, was so severe that local newspapers published pictures and descriptions of this disaster on its fiftieth anniversary.

EXCERPTS FROM THE MORNING CALL, FEBRUARY 21, 1952, RELATIVE TO THE FLOOD OF FEBRUARY 28, 1902

Allentown's Worst Flood Washed Away Lehigh's Hamilton Bridge 50 Years Ago, Utilities Shut Down

Next Thursday will be the 50th anniversary of the worst flood that ever struck Allentown and vicintiy.

One of a series of five floods recorded in less than six months, it carried away bridges, ran property damage into the hundreds of thousands of dollars and accounted for at least four deaths.

EXCERPTS FROM THE ORIGINAL NEWS STORY AND FROM ACCOUNTS PRINTED THE FOLLOWING WEEEK, THE MORNING CALL, RELATIVE TO THE FLOOD OF FEBRUARY 28, 1902

Allentown's 'Worst Flood Since Forty Years Ago, Caused Five Deaths'

The Little Lehigh and Jordan creeks exceeded anything ever seen.

The homes at the foot of Lehigh Street hill were flooded to the second stories and in some homes the people could not get out.

At Gabriel's mills the water was up to the roof and the dye house was swept away. The wire mill was closed down, but about a dozen men were imprisoned in it all night. No one ventured to relieve them.

The water works had to shut down at 3 o'clock, the water having risen as high as the basin.

In the districts covered by the Cedar and Trout creeks and the Little Lehigh, damage exceeded anything in the history of the county. The boating dam at Dorney's broke. The bridges in the vicinity of the Fountain House were washed away and several small houses were carried down the stream.

A severe flood that almost rivalled the disaster of 1902 occurred suddenly in the latter days of May 1942.

EXCERPTS FROM THE CALL CHRONICLE, MAY 24, 1942

Allentown's Flood Damage Almost Beyond Estimate

Allentown today, in keeping with its sister communities of the Lehigh Valley, is recovering from one of the worst floods in the history of the region.

Torrents of water swept into Allentown yesterday by way of its three streams to cause a sudden May flood which rivalled even the great flood of 1902.

The Lehigh river, already swollen by overtaxed streams that flow into it to the north of Allentown, was unable to carry the burden imposed upon it by the Little Lehigh and Jordan creeks in the south central portion of the city with the result that all overflowed their banks here to inundate homes, factories, mills, railroad yards and streets. The damage that resulted is inestimable.

Industrial plants located along the lowlands that border the Lehigh river and the Jordan and Little Lehigh creeks as they wind their ways through the city were hard hit by damage caused by the flood with the result that it may be many days before they can again operate normally.

It will mean the drying of stocks and scrubbing machinery and in some instances replacing equipment that has been ruined by mud, grit and water.

By the same token, families residing in homes bordering on the streams suffered great damage when the creeks virtually rushed through the houses and ruined furniture and eatables. Repairs to the decorations of homes will cost a pretty penny--after the scrubbing and drying-out process has been completed.

Public utilities, including railroads, trolley and bus companies, gas and electric companies and telephone and telegraph services, all suffered greatly from the flood.

Parks Hard Hit

Water covered meadows in back of the Rose Garden. From that point Cedar Creek held its banks fairly well to Union Terrace where the water again spilled over and flooded the picnic area and baseball field.

Lagoons in Little Lehigh Pky. near the Linde Air Products Co., were flooded. Near this point Cedar Creek empties into the Little Lehigh. A large amount of lumber stored in the vicinity floated down the stream and several automobiles were covered by water.

There was no damage along the Little Lehigh from Linde Air Products to Robinhood.

Cedar Creek spilled over its banks in Trexler Memorial park but caused little or no damage.

The floods caused by the heavy rainfall that accompanied Hurricane Diane caused great loss of life and property damage.

EXCERPTS FROM THE MORNING CALL, AUGUST 19 & 20, 1955

August 19, 1955

Yesterday's Flood Among Valley's Worst

The damaging flood waters that hit the Lehigh Valley area yesterday ranks with some of the most severe storms that have hit here since the turn of the century.

Major Flooding Looms, Many Areas Evacuated, 'Emergency' in City

The Lehigh Valley last night felt the death tremors of Hurricane Diane, and while winds did hardly at[illegible] damage, veritable cloudbursts of rain resulted in flash floods in many areas and threatened major flooding of all low-lying territories by daylight today.

August 20, 1955

Salvage workers, including highway crews, were alerted late last night to start cleaning up Allentown's flood-drenched lowlands.

The city's three streams--Lehigh, Little Lehigh and Jordan--were reportedly receding at the rate of six inches an hour.

The Lehigh River, which had spilled over its banks after Thursday night's violent storm, reached a crest of 23.4 feet at 8:30 a.m. It dropped to 16 feet by last midnight.

However, it will be several days before an actual property damage estimate can be given.

It will reach into millions of dollars as industrial plants and home owners, along the Lehigh River's banks, were washed out by the flood waters.

Chief problem for police and firemen was effective rescues for some 30 families in the areas near the Hamilton St. bridge over the Lehigh River, and along Wire, Union and 4th Sts. which had felt the effects of the overflowing Lehigh and Little Lehigh.

One group of five persons is still stranded in a cottage at Adam's Island on Lehigh River, and all means, including use of a helicopter, failed in rescuing them from their perches.

Even before the Lehigh reached flood stage last night, there were residences along its many tributaries that had their first floors flooded, and there were untold numbers of industries forced to close down operations because boiler rooms were flooded or working floors covered with dirty, surging water.

Before the river's flood, all of the streams that run through Allentown roared from their normal courses and covered wide areas. The Jordan was responsible for covering Route 145 in the vicinity of Penn Fruit Co., and flooded 3rd and Union and the Lehigh Valley Railroad station area.

Union Terrace, Cedar Parkway and Trexler Memorial Park were flooded by Cedar Creek. The Little Lehigh flooded lower Water Street and Mill Street at Lehigh. Also flooded in the Little Lehigh watershed was Auburn Street and railroad tracks and roads at East Penn Junction.

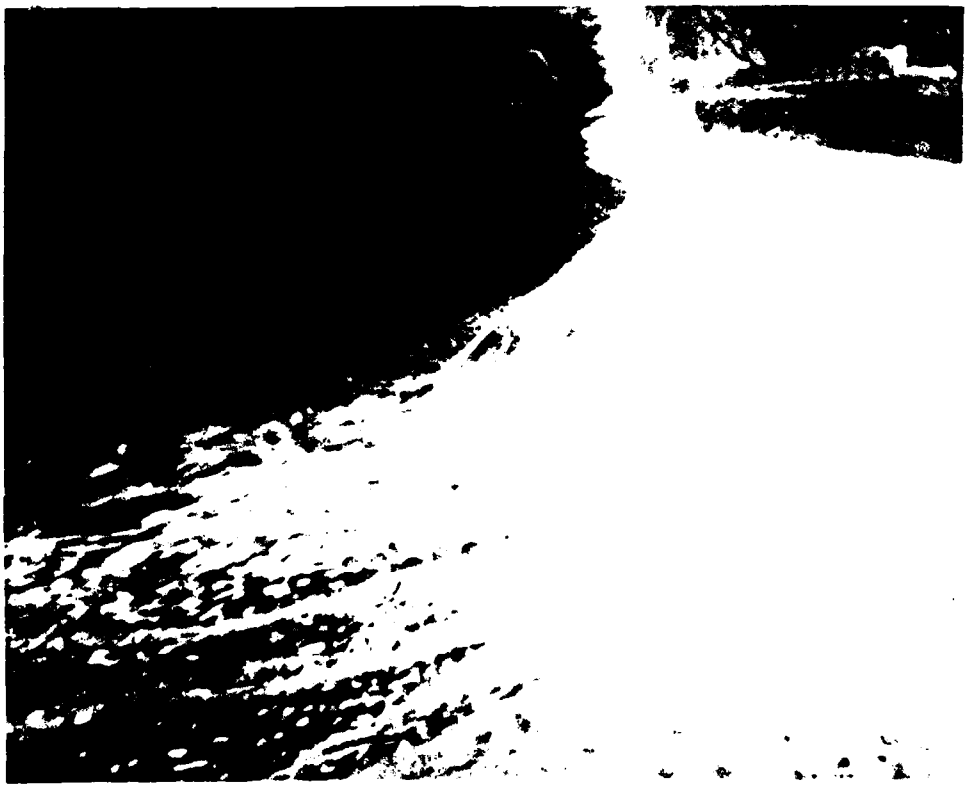


FIGURE 6 - Runoff from heavy rainfall surges toward Main Boulevard to converge with Cedar Creek near Dorney Park.

The above photograph was supplied courtesy of Dorney Park and was taken during Hurricane "Donna," September 12, 1960, as were the following Figures 7 through 10 which were supplied courtesy of the Allentown Department of Parks. As shown on Table 3, Page 13, the flooding on Little Lehigh was the eleventh highest of record. Nearby Jordan Creek experienced its fourth highest flood of record. Hurricane "Donna" caused major damages to the northeast coast and minor damages throughout eastern Pennsylvania and Delaware.

FIGURE 7 - Cedar Creek west of the Ott Street bridge, Allentown, Pennsylvania.

FIGURE 8 - Vicinity of Cedar Park Pool near Ott Street and Parkway Boulevard.

FIGURE 9 - Cedar Creek as it appeared from the rear of the Allentown Department of Parks Building located on Parkway Boulevard.

FIGURE 10 - Union Terrace vicinity of Cedar Creek. Note the inundated railroad tracks in the foreground.

On June 22, 1972, Tropical Storm Agnes brought heavy rains to an already water-soaked Lehigh Valley, causing flooding in many low-lying areas along the Little Lehigh, Cedar, and Little Cedar Creeks.

EXCERPTS FROM THE MORNING CALL, JUNE 23, 1972

Storm 'Supersaturates' Lehigh Valley Area, River-Flood Warnings Are Issued for Today

Many Flee High Water, Roads Cut

A merciless Tropical Storm Agnes unleashed almost-constant rain on the Lehigh Valley area yesterday.

Because the ground was saturated before her arrival, the area was hard-hit by the 3 to 7 inch deluge.

Flooded basements were commonplace.

Just about every creek and stream in the nine-county area served by *The Morning Call* went over its banks, causing families to evacuate their homes and closing roads.

River flood warnings were posted for early today.

Ernest Christine, Allentown Water Bureau's filtration superintendent, issued a warning for residents to conserve water last night. He feared the city might have to rely on its two reservoirs for its water supply.

He said the Little Lehigh Creek flooding was the highest he has seen in his 31 years with the city.

The weather service at A-B-E Airport noted that yesterday's rainfall coupled with Wednesday's (June 21) brought the two-day tally to 3.83 inches.

Allentown streets were barricaded at about 20 places where streams overflowed or storm drains were unable to handle the runoff.

The low-lying sections adjacent to Little Lehigh, Jordan, Trout and Cedar Creeks were transformed into lakes. So were parts of the Municipal Golf Course, Trexler Park and other sites.

EXCERPTS FROM THE MORNING CALL, JUNE 24, 1972

More Showers This Weekend

Lehigh Valley Area Floods Claim Three Lives

Most of the area streams that had flooded Thursday night receded to within their banks by yesterday (June 23) morning. A flood warning was lifted at 5 p.m.

Allentown's Municipal Golf Course and Jordan Park and Cedar Beach pools have been closed until further notice because of high water and debris.

A threatened water shortage in Allentown failed to materialize when the Little Lehigh Creek waters pulled back enabling water bureau crewmen to prevent debris from blocking a screen leading to the filtration plant.

On the other hand, the receding waters elsewhere uncovered a mess of mud, tree branches, and other assorted debris in public swimming pools, business places and public parks.

FIGURE 11 - Heavy rains from Tropical Storm Agnes on June 22, 1972, caused the Little Lehigh Creek to flood this section of the Lehigh Parkway.

FIGURE 12 - Tropical Storm Agnes caused Cedar Creek to overflow its banks along Hamilton Street. This flooding was approximately equal to an Intermediate Regional Flood (IRF) at the bridge. (Note the flood profile on Plate No. 10.)

FUTURE FLOODS

Floods of the same or larger magnitude as those that have occurred in the past could occur in the future. Larger floods have been experienced in the past on streams with similar geographical and physiographical characteristics as those found in the study area. Similar combinations of rainfall and runoff which caused these floods could occur in the study area. Therefore, to determine the flooding potential of the study area, it was necessary to consider storms and floods that have occurred in regions of like topography, watershed cover, and physical characteristics. Discussion of the future floods in this report is limited to those that have been designated as the Intermediate Regional Flood and the Standard Project Flood. The estimates of the Intermediate Regional Flood and the Standard Project Flood as presented in this report are based on the existing development of the watershed since future changes within the basin cannot be accurately predicted. The Standard Project Flood represents a reasonable upper limit of expected flooding in the study area. The Intermediate Regional Flood may reasonably be expected to occur more frequently although it will not be as severe as the infrequent Standard Project Flood.

Intermediate Regional Flood

The Intermediate Regional Flood is defined as one that occurs once in 100 years on the average, although it could occur in any year. The peak flow of this flood was developed from statistical analyses of streamflow and precipitation records and runoff characteristics for Little Lehigh Creek, Cedar Creek, and Little Cedar Creek. Peak flows thus developed for the Intermediate Regional Flood at selected locations in the study area are shown in Table 4.

Standard Project Flood

The Standard Project Flood is defined as a major flood that can be expected to occur from a severe combination of meteorological and hydrological conditions that is considered reasonably characteristic of the geographical area in which the study area is located, excluding extremely rare combinations. The Corps of Engineers, in cooperation with the NOAA Weather Service, has made comprehensive studies and investigations based on the past records of experienced storms and floods and has developed generalized procedures for estimating the flood potential of streams. Peak discharges for the Standard Project Flood at selected locations in the study area are shown in Table 4. A discharge hydrograph for the

Standard Project Flood at the U.S. Geological Survey gaging station is shown on Plate 15. The relative water surface elevations for the Intermediate Regional Flood and the Standard Project Flood are shown on Plates 8, 9, and 10.

TABLE 4
PEAK FLOWS FOR THE INTERMEDIATE REGIONAL AND STANDARD PROJECT FLOODS

Location	River Mile	Drainage Area sq. mi.	Intermediate Regional Flood Discharge cfs	Standard Project Flood Discharge cfs
Little Lehigh Creek				
At the Mouth	0	188.0	22,400	49,600
Downstream of Jordan Creek (Including Jordan Creek)	0.64	178.6	22,100	48,900
Upstream of Jordan Creek (Excluding Jordan Creek)	0.64	97.6	8,600	28,400
Downstream of Cedar Creek (Including Cedar Creek)	2.61	95.9	8,500	28,100
Upstream of Cedar Creek (Excluding Cedar Creek)	2.61	80.9	7,600	27,800
At U.S.G.S. Gage	3.41	80.8	7,300	27,400
Downstream of Leibert Run (Including Leibert Run)	9.14	73.7	6,700	25,300
Upstream of Leibert Run (Excluding Leibert Run)	9.14	67.4	6,200	23,000
At End of Study Area	9.39	67.3	6,200	23,000
Cedar Creek Tributary				
At the Mouth	0	15.0	3,200	8,300
Downstream of Little Cedar Creek (Including Little Cedar Creek)	2.37	10.2	2,700	5,500
Upstream of Little Cedar Creek (Excluding Little Cedar Creek)	2.37	5.2	1,900	2,500
Little Cedar Creek Tributary				
At the Mouth	0	5.0	1,900	3,000

Table 5 shows comparisons of flood elevations for the Intermediate Regional and Standard Project Floods with the highest recorded floods at the U.S. Geological Survey gage on Little Lehigh Creek near Allentown, Pennsylvania.

TABLE 5
COMPARISONS OF FLOOD ELEVATIONS
U.S.G.S. Gage Near Allentown, Pennsylvania

Flood	Elevation ft.-m.s.l.d.
Standard Project	275.3
Intermediate Regional	265.5
June 22, 1972	265.2
July 9, 1935[a]	262.9
July 28, 1969	261.1

(a) Information furnished by the City of Allentown. (Flood Mark)

Frequency

A frequency curve of peak flows was developed from available recorded annual peaks. The curve presents the frequency of floodflows up to the magnitude of once in 100 years (Intermediate Regional Flood). Frequencies of floods equivalent to the Standard Project Flood and larger can be obtained through extrapolation of the curve, but it is not practical to assign a frequency to such large flows as their occurrence is so extremely rare. The curve, which is available upon request, reflects the judgment of engineers who have studied the area and are familiar with the region; however, it must be regarded as approximate and should be used with caution in connection with any planning of flood plain use.

Hazards of Large Floods

The extent of damage caused by any flood depends on the topography of the area flooded, depth and duration of flooding, velocity of flow, rate of rise, and developments in the flood plain. An Intermediate Regional or Standard Project Flood on Little Lehigh Creek, Cedar Creek, or Little Cedar Creek would result in the inundation of residential, commercial, and industrial properties. Deep floodwater flowing at high velocity and carrying floating debris would create conditions hazardous to persons and vehicles attempting to cross flooded areas. In general, floodwater 3 or more feet deep and flowing at a velocity of 3 or more feet per second could easily sweep an adult person off his feet, thus creating definite danger of injury or drowning. Rapidly rising and swiftly flowing floodwater may trap persons in homes that are ultimately destroyed, or in vehicles that are ultimately submerged or floated. Water lines can be ruptured by deposits of debris and the force of floodwaters, thus creating the possibility of contaminated domestic water supplies. Damaged sanitary sewer lines and sewage treatment plants could result in the pollution of floodwaters creating health hazards. Isolation of areas by floodwater could create hazards in terms of medical, fire, or law enforcement emergencies.

Flooded areas and flood damages - The areas along the study reach of Little Lehigh Creek, Cedar Creek, and Little Cedar Creek that would be flooded by the Standard Project Flood are shown on Plate 2 which is also an index map to Plates 3 through 7. Areas that would be flooded by the Intermediate Regional and Standard Project Floods are shown in detail on Plates 3 through 7. The actual limits of these overflow areas may vary somewhat from those shown on the maps because the 10-foot contour interval and scale of the map do not permit precise plotting of the flooded area boundaries. As may be seen from these plates, floodflows from Little Lehigh Creek, Cedar Creek, and Little Cedar Creek inundate residential, commercial, and industrial properties in the City of Allentown, resulting in considerable damage and necessitating costly expenditures for emergency relief, clean up, and repair. Additional hardships include loss of utility service and transportation facilities and health hazards associated with contaminated water supplies. Considerable damage to these facilities would occur during an Intermediate Regional Flood. However, due to the wider extent, greater depths of flooding, higher velocity flow, and longer duration of flooding during a Standard Project Flood, damage would be even more severe than during an Intermediate Regional Flood.

Plates 8, 9, and 10 show the water surface profiles for the Intermediate Regional and Standard Project Floods. Depth of flow in the stream channels can be estimated from these illustrations. Cross sections of the flood plain at selected locations, together with water surface elevations and the lateral extent of the Intermediate Regional and Standard Project Floods are shown on Plates 11, 12, 13, and 14.

Obstructions - During floods, debris collecting on bridges and culverts could decrease their carrying capacity and cause greater water depths (backwater effect) upstream of these structures. Since the occurrence and amount of debris are indeterminate factors, only the physical characteristics of the structures were considered in preparing profiles of the Intermediate Regional and Standard Project Floods. Similarly, the maps of flooded areas show the backwater effect of obstructive bridges and culverts, but do not reflect the increased water surface elevation that could be caused by debris collecting against the structures, or by deposition of silt in the stream channel under structures. As previously indicated, there are 11 dams within the study area which have no flood control capacities nor will they seriously alter flow characteristics of floodwaters. Of the 58 studied bridges crossing Little Lehigh Creek, Cedar Creek, and Little Cedar Creek, 42 are obstructive to the Intermediate Regional Flood and 51 are obstructive to the Standard Project Flood. The two culverts on Little Cedar Creek are also obstructive to both the Intermediate Regional and Standard Project Floods. Table 6 shows water surface elevations at these bridges.

TABLE 6
ELEVATION DATA

Bridges Across Little Lehigh Creek, Cedar Creek, and Little Cedar Creek

Identification	Mileage Above Mouth	Underclearance Elevation	Water Surface Elevation	
			Intermediate Regional Flood	Standard Project Flood
		ft. - m.s.l.d.	ft. - m.s.l.d.	
Little Lehigh Creek				
N.J. Central R.R.	0.30	263.1	251.0	259.8
Lehigh Valley R.R.	0.44	246.2	251.9	260.9
Basin St.	0.47	254.3	251.9	262.2
Lehigh Valley R.R.	0.57	248.5	252.5	262.5
N.J. Central R.R.	0.62	247.6	253.3	262.9
Lehigh Valley R.R.	0.81	244.6	253.4	263.2
Lehigh St.	1.15	248.0	255.3	264.8
Lehigh Valley R.R.	1.16	247.2	255.3	264.9
South 8th St.	1.38	...	255.8	265.0
South 10th St.	1.59	255.1	256.3	265.5
Ward St.	2.13	285.6	259.1	267.3
Lehigh Parkway East	2.46	263.7	261.0	269.1
Lehigh Valley R.R.	2.74	257.8	261.9	269.9
Lehigh Parkway	2.81	266.1	263.6	272.8
Little Lehigh Parkway at U.S.G.S. Gaging Sta.	3.41	261.0	265.5	275.3
Park Drive	4.06	271.3	269.7	278.7
Bogert's Bridge	4.79	275.9	274.5	283.2
Oxford Dr.	4.82	289.7	278.1	286.0
Pa. Rt. 309	5.11	333.8	278.9	287.3
Private Rd. at Fish Hatchery	5.54	276.4	283.1	291.7
Hatchery Rd.	5.64	288.3	289.3	294.9
Devonshire Rd.	6.28	302.1	299.1	306.1
Keck's Bridge	6.80	306.8	307.1	311.5
Country Club	7.20	303.1	309.1	317.0
Country Club	7.26	303.7	309.2	317.5
Weida's Mill Bridge	7.41	305.9	311.0	319.0
Bridge to River Dale Farm	8.17	315.3	319.2	327.0
Pa. Rt. 29	8.83	327.9	331.7	335.3
Camp Olympic Private Rd.	9.13	326.4	332.7	339.9
Pa. Turnpike	9.39	359.7	333.4	340.7
Cedar Creek				
Richards Fertilizer Plant Bridge	0.19	258.3	263.5	270.1
Lehigh Valley R.R.	0.34	259.2	266.6	271.2
Mosser St.	0.44	261.7	268.0	272.5
So. St. Elmo St.	0.69	266.8	270.2	274.7
Union St.	0.83	270.0	271.2	275.4
Foot Bridge, Walnut St.	0.90	272.7	274.5	276.0
Walnut St., Highway Bridge	0.90	272.2	274.7	276.7
Hamilton St.	1.00	272.0	276.0	277.9
Foot Bridge	1.08	272.8	276.9	279.6
Foot Bridge	1.44	275.9	279.2	282.7

TABLE 6 (Continued)
ELEVATION DATA

Bridges Across Little Lehigh Creek, Cedar Creek, and Little Cedar Creek

Identification	Mileage Above Mouth	Underclearance Elevation	Water Surface Elevation	
			Intermediate Regional Flood	Standard Project Flood
		ft. - m.s.l.d.	ft. - m.s.l.d.	
Cedar Creek (Cont'd.)				
Cedar Creek Park Highway Bridge	1.50	278.1	281.0	283.2
Foot Bridge	1.59	279.0	282.0	284.4
Foot Bridge	1.63	280.9	282.7	285.1
Ott St.	1.67	286.0	283.6	286.2
Foot Bridge	1.69	281.6	284.0	286.6
30th St.	2.14	286.3	289.3	291.5
Cedar Crest Blvd.	2.42	293.7	293.4	295.9
Lower Main Blvd.	2.92	301.9	304.2	306.8
Dorney Park	3.22	305.3	307.6	308.3
Dorney Park	3.31	307.5	311.3	312.1
Dorney Park	3.37	312.2	311.5	312.1
Cedar Brook Rd.	3.77	322.0	324.0	324.8
Little Cedar Creek				
Parkway Blvd.	0.06	293.0	294.0	295.6
Lower Memorial Park	0.15	293.3	295.4	296.3
Rt. 29/Cedar St.	0.50	311.0	314.7	315.6
Lower Memorial Park Foot Bridge	0.76	320.2	322.2	323.2
Highland St.	0.81	324.1	325.5	326.1
Golf Course	0.87	322.8	326.0	327.0
Spring Haven Rd.	1.69	347.7	349.8	350.3
Pa. Rt. 309/Cedar Crest	2.19	383.9	379.5	383.9

Velocities of flow - Velocities of floodwaters depend largely on the characteristics of the stream channel and overbank areas. The size and shape of stream cross sections, the conditions of the stream and banks such as ground cover, and the slope of the streambed all vary on different streams and at different locations on the same stream. During an Intermediate Regional Flood, velocities of main channel flow would be 5 - 10 feet per second on Little Lehigh Creek, 4 - 8 feet per second on Cedar Creek, and 10 - 12 feet per second on Little Cedar Creek. Water flowing at this rate is capable of transporting large objects and severely eroding streambanks and fill around bridge abutments. It is expected that velocity of main channel flow during a Standard Project Flood would be slightly higher than during an Intermediate Regional Flood. Overbank flows for the Standard Project Flood would average 2 - 3 feet per second on Little Lehigh Creek, 1 - 2 feet per second on Cedar Creek, and 2 - 3 feet per second on Little Cedar Creek. Water flowing at 2 feet per second or less

would deposit debris and silt. Table 7 lists the maximum velocities that would occur in the main channel and overbank areas of Little Lehigh Creek, Cedar Creek, and Little Cedar Creek during the Intermediate Regional and Standard Project Floods.

TABLE 7
MAXIMUM AVERAGE VELOCITIES[a]
Little Lehigh Creek, Cedar Creek, and Little Cedar Creek

Location	Mileage Above Mouth	Maximum Average Velocities			
		Intermediate Regional Flood		Standard Project Flood	
		Channel	Overbank[b]	Channel	Overbank[b]
		ft/sec	ft/sec	ft/sec	ft/sec
Little Lehigh Creek					
Cross Section No. 4	0.98	4.8	0.9	6.6	1.4
Cross Section No. 5	1.27	6.2	1.0	8.0	1.6
Cross Section No. 7	1.91	10.5	1.7	12.8	2.5
Cross Section No. 12	4.31	6.7	1.4	11.7	2.7
Cross Section No. 14	5.36	9.8	1.6	13.5	3.0
Cross Section No. 16	6.53	9.4	1.7	15.4	3.3
Cross Section No. 18	7.92	9.6	1.6	13.9	2.8
Cross Section No. 19	8.35	9.7	1.7	15.1	3.3
Cedar Creek					
Cross Section No. 3	0.59	4.1	1.3	6.0	1.9
Cross Section No. 7	1.87	5.7	1.4	8.2	2.1
Cross Section No. 8	2.38	8.3	1.7	9.2	2.2
Little Cedar Creek					
Cross Section No. 3	0.53	12.4	2.8	15.4	3.7
Cross Section No. 5	1.10	9.9	1.7	11.7	2.2
Cross Section No. 7	1.91	10.8	2.1	12.9	2.7

(a) In reaches unaffected by bridges or other channel constructions
(b) Value given is the greater of the left and right overbank velocity

Rates of rise and duration of flooding - Intense rainfalls that accompany severe storm fronts usually produce the floods occurring along Little Lehigh Creek, Cedar Creek, and Little Cedar Creek. There is usually a time lag of several hours before flooding occurs along the stream banks. Floods generally rise slowly and remain out of banks for long periods of time. Table 8 gives maximum rate of rise and height of rise (from critical stage level to maximum floodflow level), time of rise (time period corresponding to height of rise), and duration of critical stage (period of time flooding is above critical stage level) for the Standard Project Flood (SPF), and the floods of August 18, 1946, and August 18, 1955, on Little Lehigh Creek near Allentown, Pennsylvania.

TABLE 8
RATES OF RISE AND DURATION
Little Lehigh Creek near Allentown, Pennsylvania

Flood	Maximum Rate of Rise ft./hr.	Height of Rise ft.	Time of Rise hrs.	Duration of Critical Stage hrs.
August 18, 1946	1.1	1.1	1.8	3.9
August 18, 1955	0.8	2.2	4.4	22.0
Standard Project	2.0	17.9	29.0	73.5

Photographs, future flood heights - The levels that the Intermediate Regional and Standard Project Floods are expected to reach at various locations along Little Lehigh Creek, Cedar Creek, and Little Cedar Creek are indicated on the following photographs.

FIGURE 12 -
Future flood depths
at Lehigh Street. The
flood depth would
would be about
above the road.

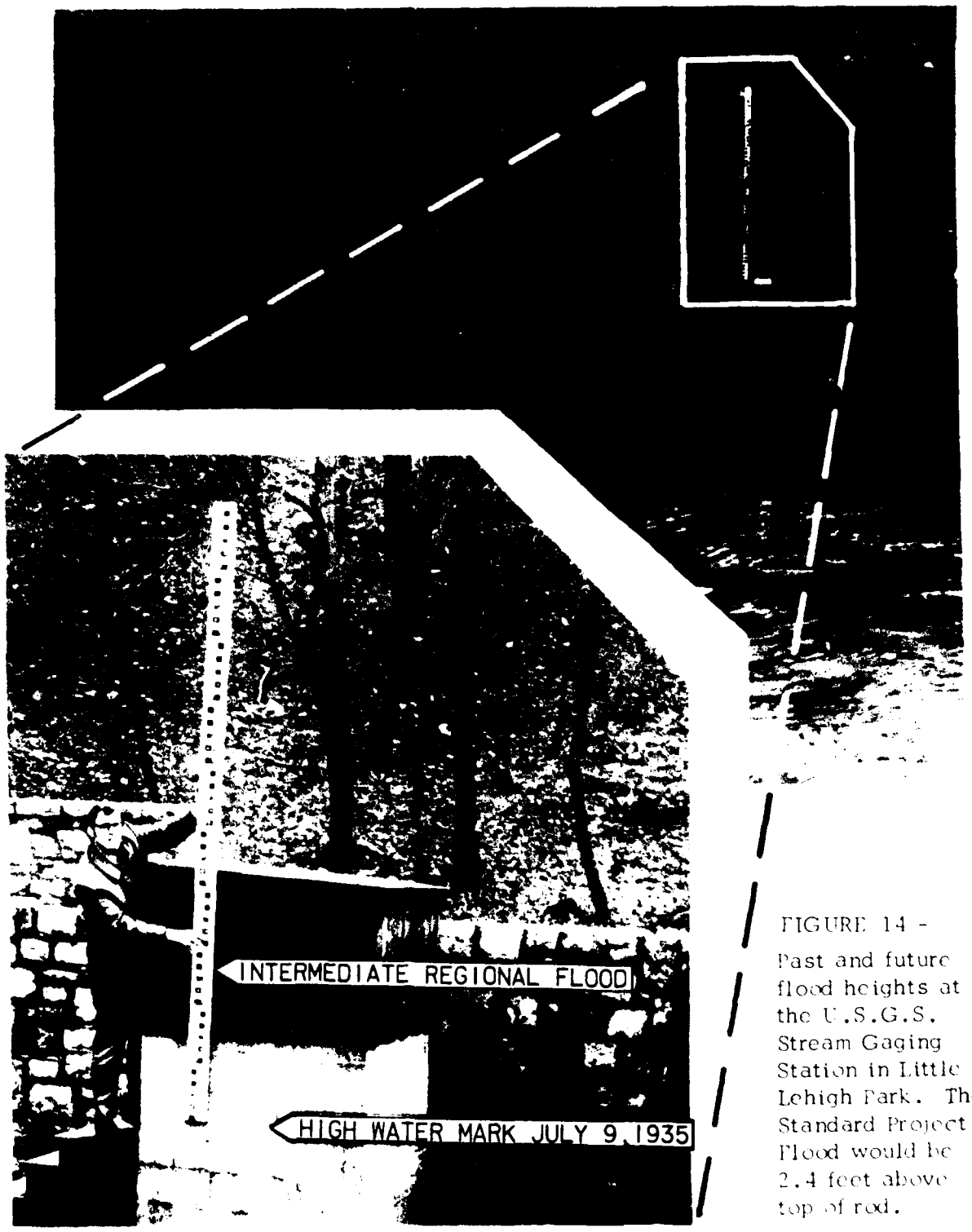


FIGURE 14 - Past and future flood heights at the U.S.G.S. Stream Gaging Station in Little Lehigh Park. The Standard Project Flood would be 2.4 feet above top of rod.

FIGURE 15 - Future flood heights at Bogert's Bridge.

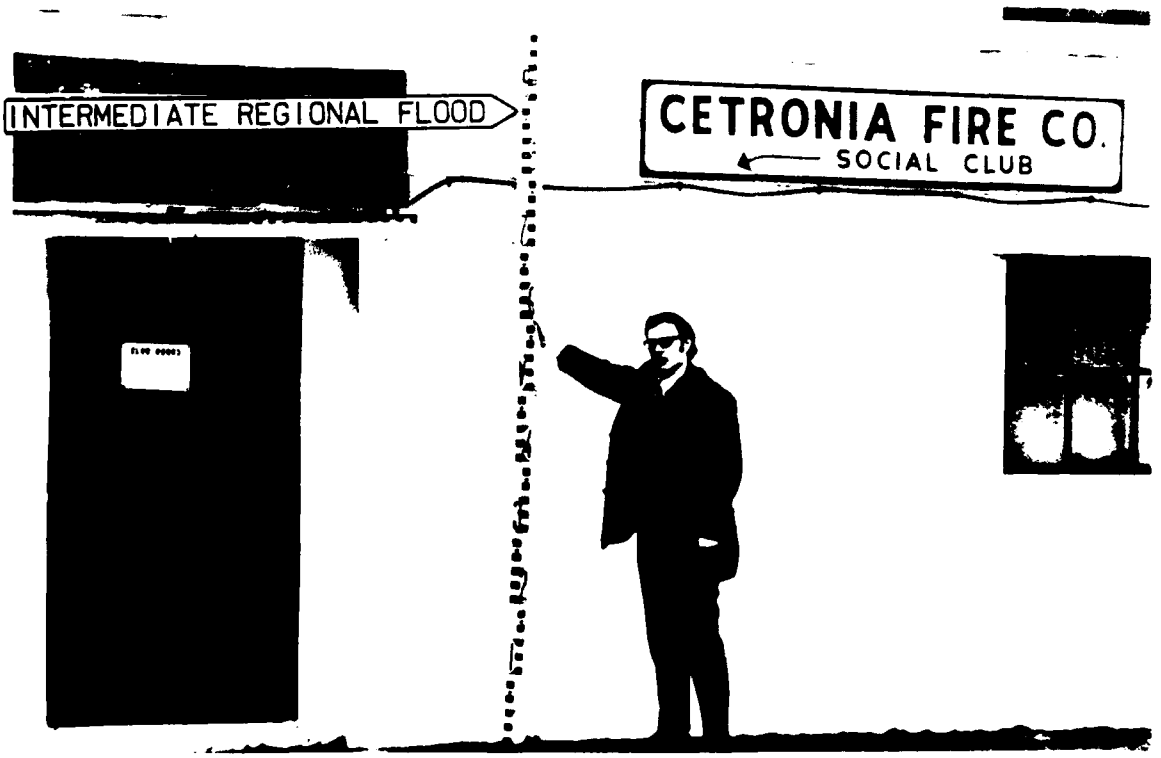


FIGURE 16 - Future flood height at the Cetronia Fire Company Social Club. The Standard Project Flood would be 6.7 feet above top of rod.

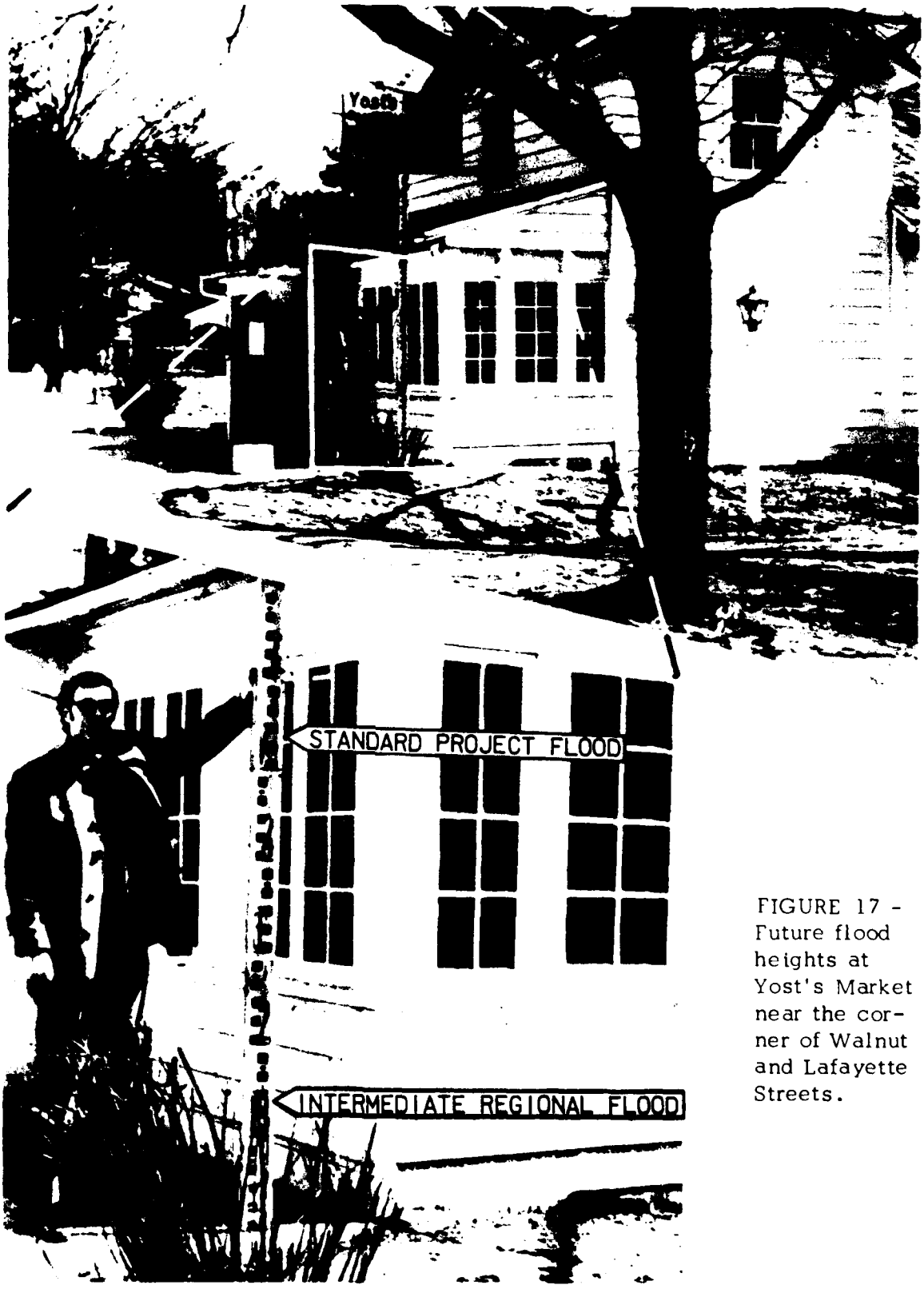


FIGURE 17 - Future flood heights at Yost's Market near the corner of Walnut and Lafayette Streets.

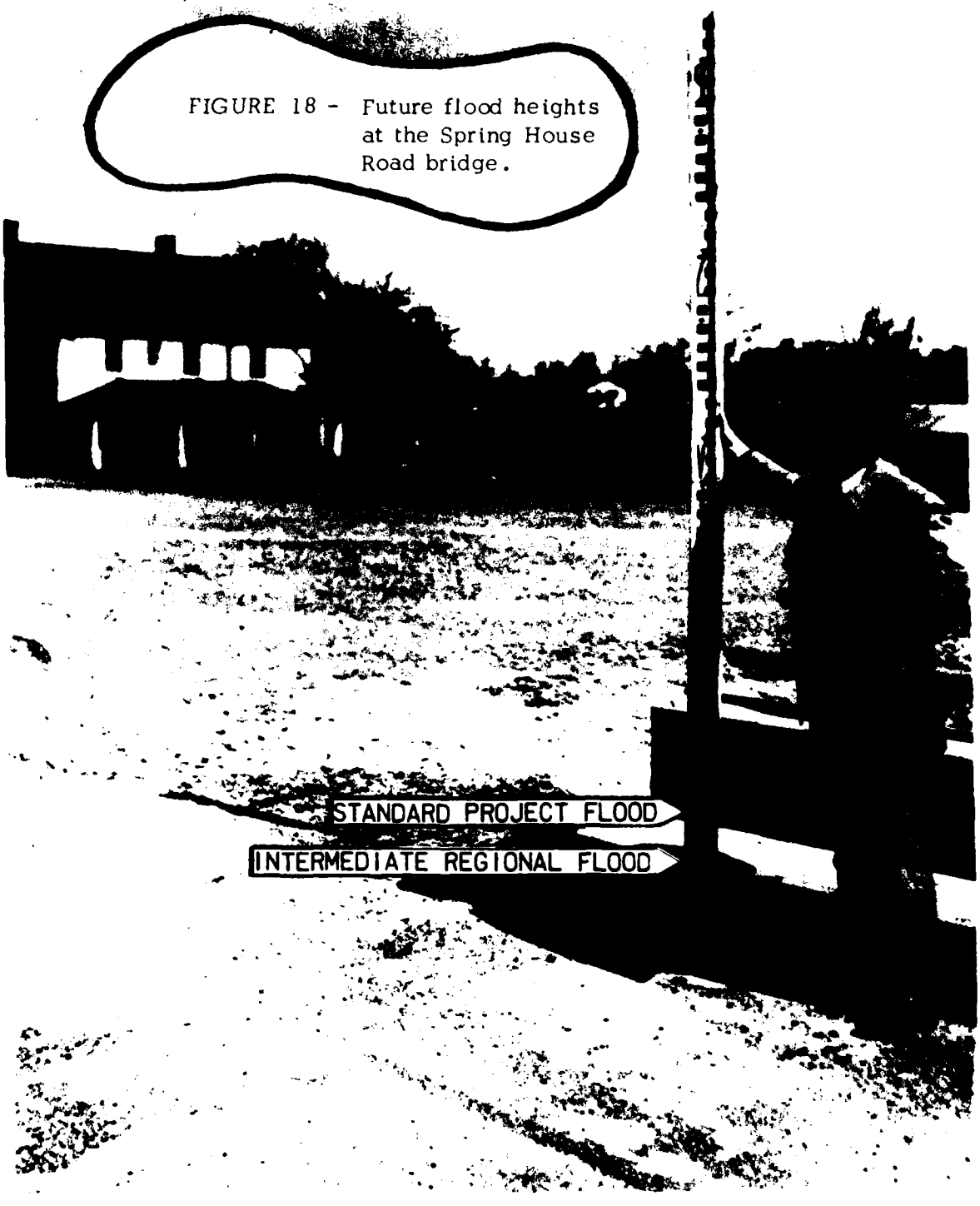


FIGURE 18 - Future flood heights at the Spring House Road bridge.

GLOSSARY

Backwater. The resulting high water surface in a given stream due to a downstream obstruction or high stages in an intersecting stream.

Flood. An overflow of lands not normally covered by water and that are used or usable by man. Floods have two essential characteristics: The inundation of land is temporary; and the land is adjacent to and inundated by overflow from a river, stream, ocean, lake, or other body of standing water.

Normally a "flood" is considered as any temporary rise in streamflow or stage, but not the ponding of surface water, that results in significant adverse effects in the vicinity. Adverse effects may include damages from overflow of land areas, temporary backwater effects in sewers and local drainage channels, creation of unsanitary conditions or other unfavorable situations by deposition of materials in stream channels during flood recessions, rise of ground water coincident with increased streamflow, and other problems.

Flood Crest. The maximum stage or elevation reached by the waters of a flood at a given location.

Flood Plain. The areas adjoining a river, stream, watercourse, ocean, lake, or other body of standing water that have been or may be covered by floodwater.

Flood Profile. A graph showing the relationship of water surface elevation to location, the latter generally expressed as distance above mouth for a stream of water flowing in an open channel. It is generally drawn to show surface elevation for the crest of a specific flood, but may be prepared for conditions at a given time or stage.

Flood Stage. The stage or elevation at which overflow of the natural banks of a stream or body of water begins in the reach or area in which the elevation is measured.

Hurricane. An intense cyclonic windstorm of tropical origin in which winds tend to spiral inward in a counterclockwise direction toward a core of low pressure, with maximum surface wind velocities that equal or exceed 75 miles per hour (65 knots) for several minutes or longer at some points. Tropical storm is the term applied if maximum winds are less than 75 miles per hour.

Hydrograph. A graph showing flow values against time at a given point, usually measured in cubic feet per second. The area under the curve indicates total volume of flow.

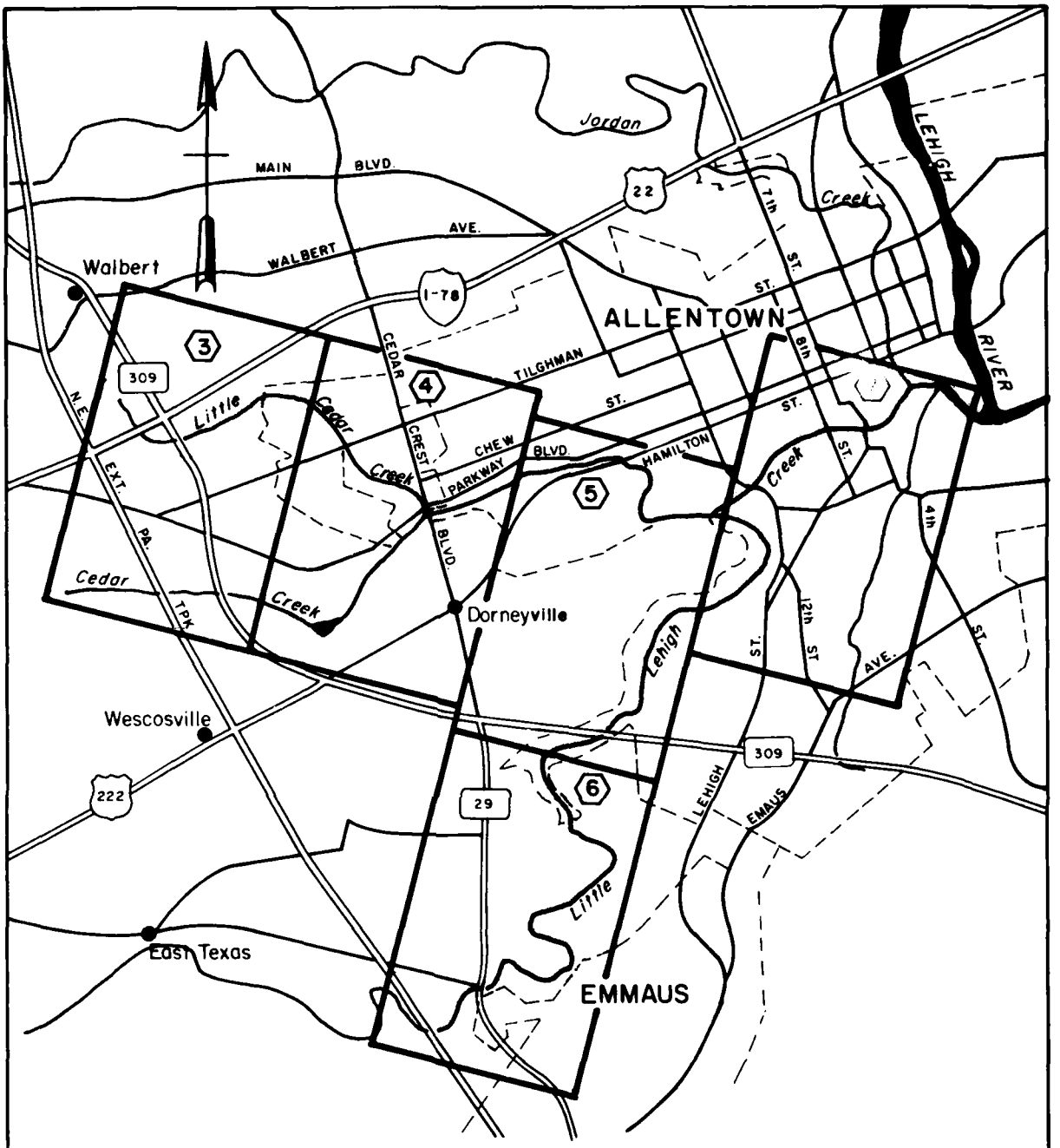
Intermediate Regional Flood. A flood having an average frequency of occurrence in the order of once in 100 years although the flood may occur in any year. It is based on statistical analyses of streamflow records available for the watershed and analyses of rainfall and runoff characteristics in the general region of the watershed.

Left Bank. The bank on the left side of a river, stream, or watercourse, looking downstream.

Right Bank. The bank on the right side of a river, stream, or watercourse, looking downstream.

Standard Project Flood. The flood that may be expected from the most severe combination of meteorological and hydrological conditions that are considered reasonably characteristic of the geographical area in which the drainage basin is located, excluding extremely rare combinations. Peak discharges for these floods are generally about 40-60 percent of the Probable Maximum Floods for the same basins. As used by the Corps of Engineers, Standard Project Floods are intended as practicable expressions of the degree of protection that should be sought in the design of flood control works, the failure of which might be disastrous.

Underclearance Elevation. The elevation at the top of the opening of a culvert, or other structure through which water may flow along a watercourse.



SCALE IN FEET
0

LEGEND

(4) PLATE NUMBER

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

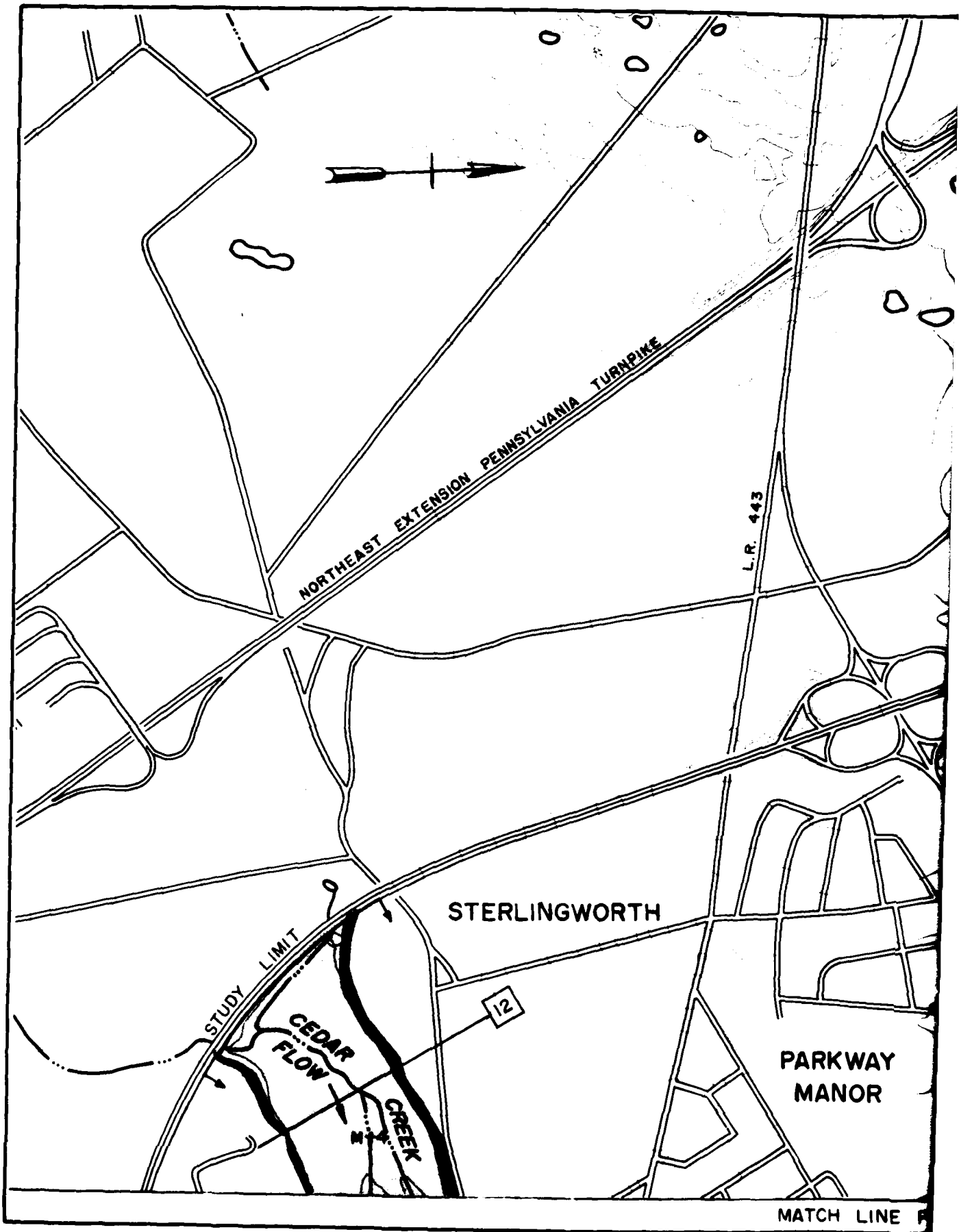
FLOOD PLAIN INFORMATION

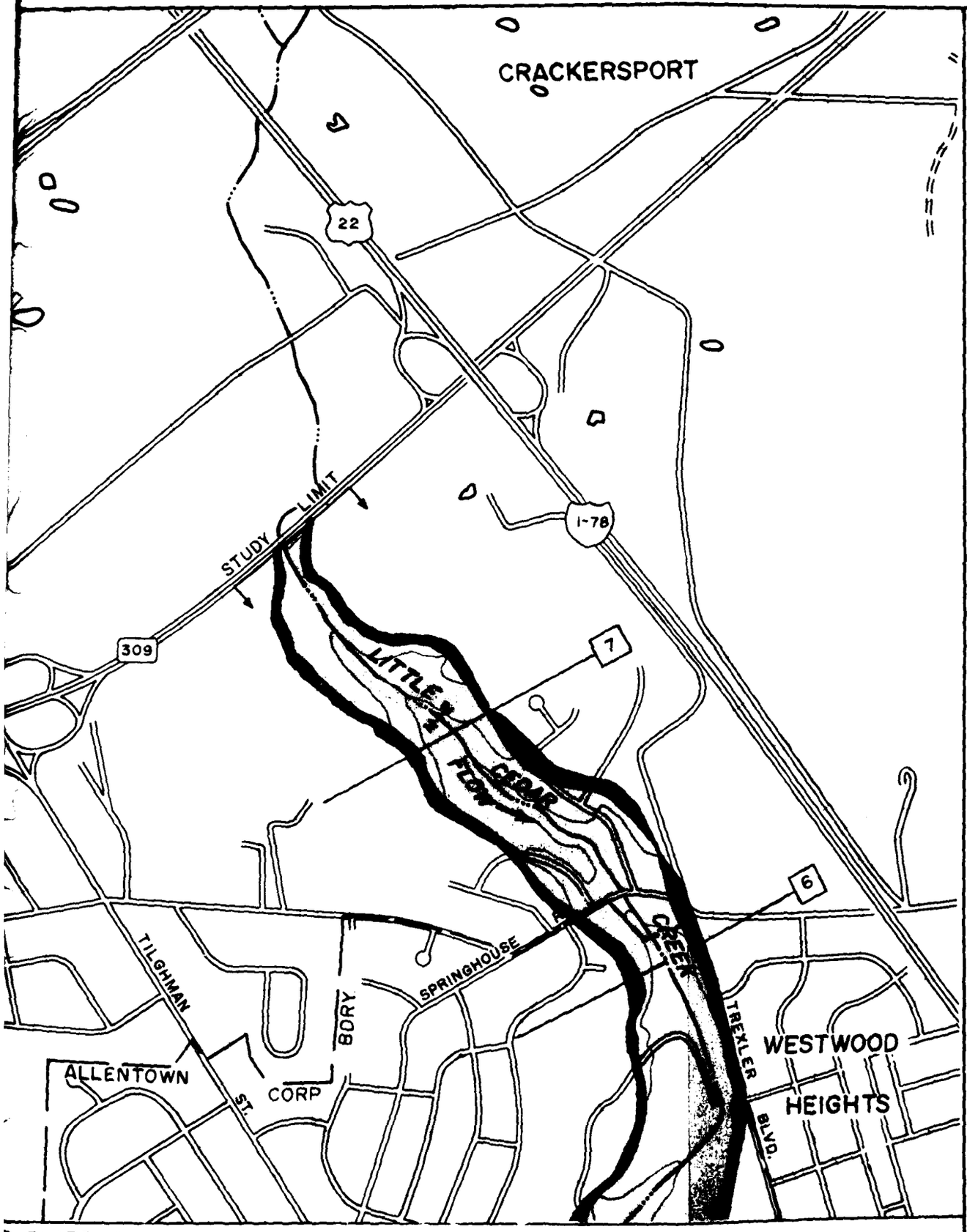
CITY OF ALLENTOWN
PENNSYLVANIA

INDEX MAP
FLOODED AREAS

OCTOBER 1972

PLATE 2


NORTHEAST EXTENSION PENNSYLVANIA TURNPIKE
L.R. 443
STERLINGWORTH
STUDY LIMIT
CEDAR FLOW CREEK
12
PARKWAY MANOR
MATCH LINE



LEG

OVERFLO

INTERM
REGIONA
FLOOD

M+2 MILES A

6 CROSS S

GROUND
G.S. 1

CHANNEL

CITY L

NOTES

1 MAP BASED ON U.S.
ALLENTOWN EAST AN
MINOR ADDITIONS A
CORPS OF ENGINEER

2. LIMITS OF OVERFLO
ACTUAL LOCATION
THE REPORT.

3. AREAS OUTSIDE THE
SUBJECT TO FLOODI

4. MINIMUM CONTOUR

SCAL

0

DEPARTM
PHILADELPHIA DIST
PHILADELPH

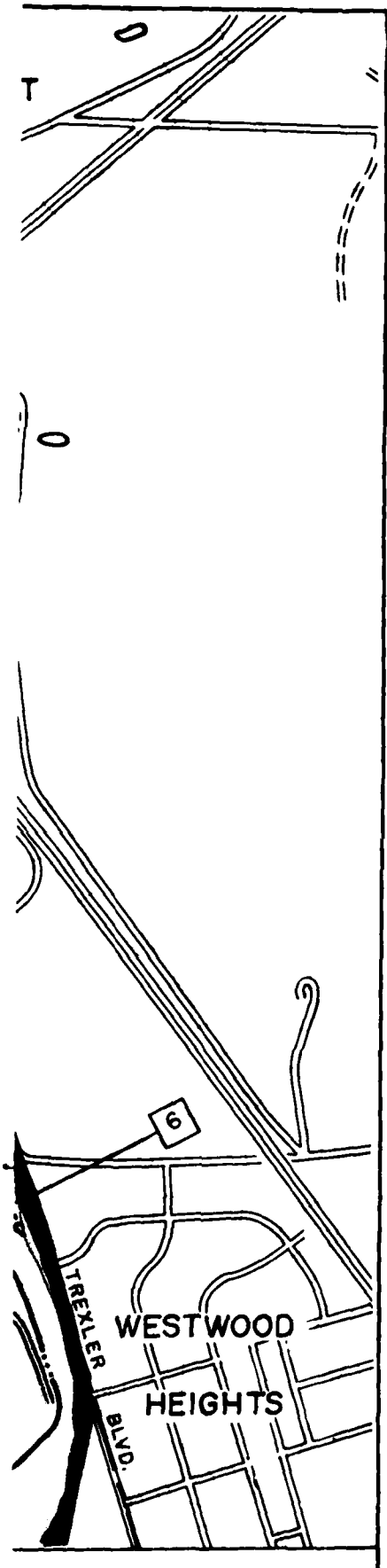
FLOOD PLA

CITY O
PENN

FLOOD

OCT

E PLATE 4



LEGEND

OVERFLOW LIMITS

INTERMEDIATE REGIONAL FLOOD — STANDARD PROJECT FLOOD

M+2 MILES ABOVE MOUTH

6 CROSS SECTION

GROUND ELEVATION IN FEET (U.S.C.& G.S. 1929 ADJ.) SEA LEVEL DATUM

CHANNEL

CITY LIMITS

NOTES

1. MAP BASED ON U.S.G.S. 7.5 MIN. QUADRANGLE ALLENTOWN EAST AND ALLENTOWN WEST, 1964 MINOR ADDITIONS AND MODIFICATIONS MADE BY CORPS OF ENGINEERS.
2. LIMITS OF OVERFLOW SHOWN MAY VARY FROM ACTUAL LOCATION ON GROUND AS EXPLAINED IN THE REPORT.
3. AREAS OUTSIDE THE FLOOD PLAIN MAY BE SUBJECT TO FLOODING FROM LOCAL RUNOFF.
4. MINIMUM CONTOUR INTERVAL IS 10 FT.

SCALE IN FEET

0 800 1600

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

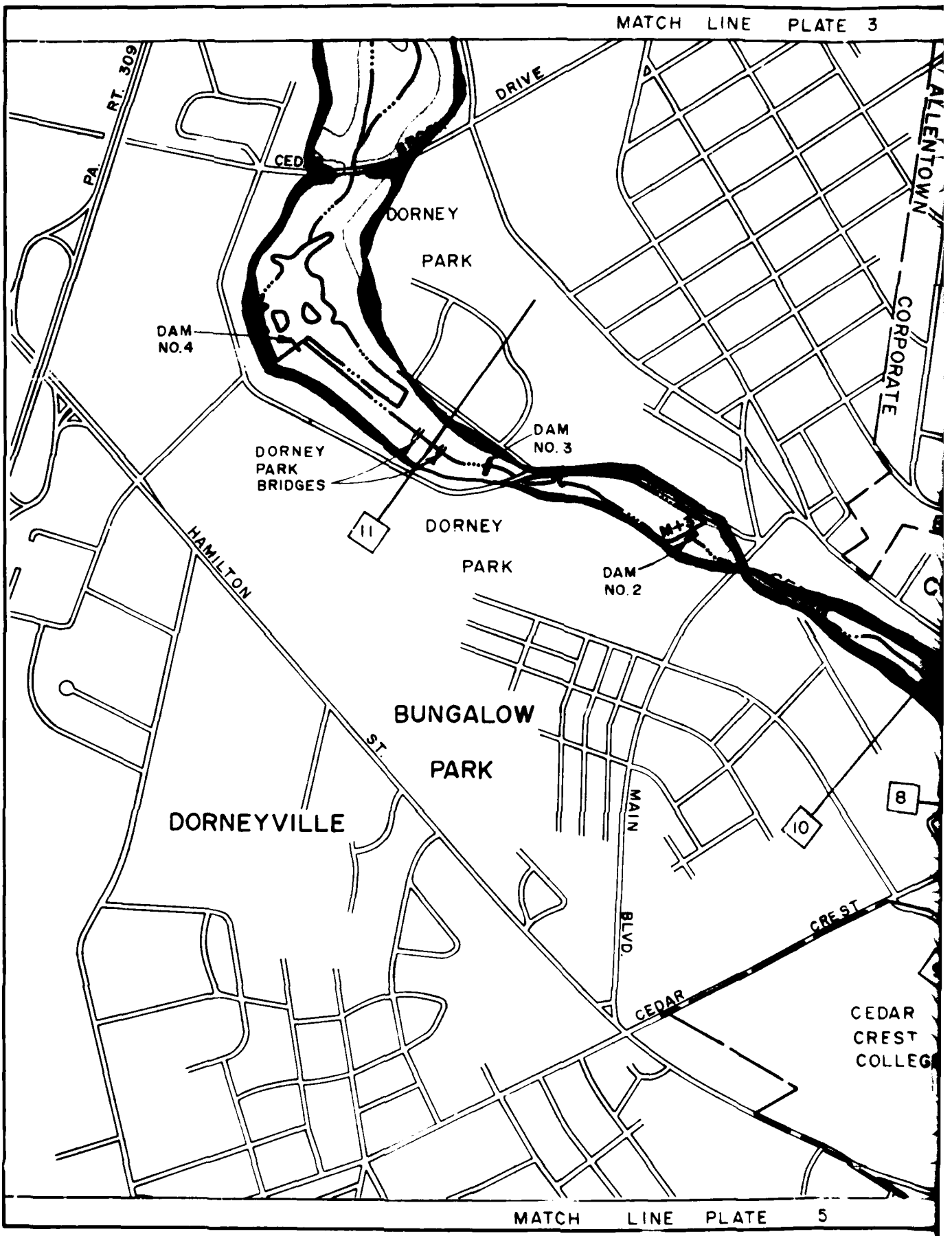
FLOOD PLAIN INFORMATION

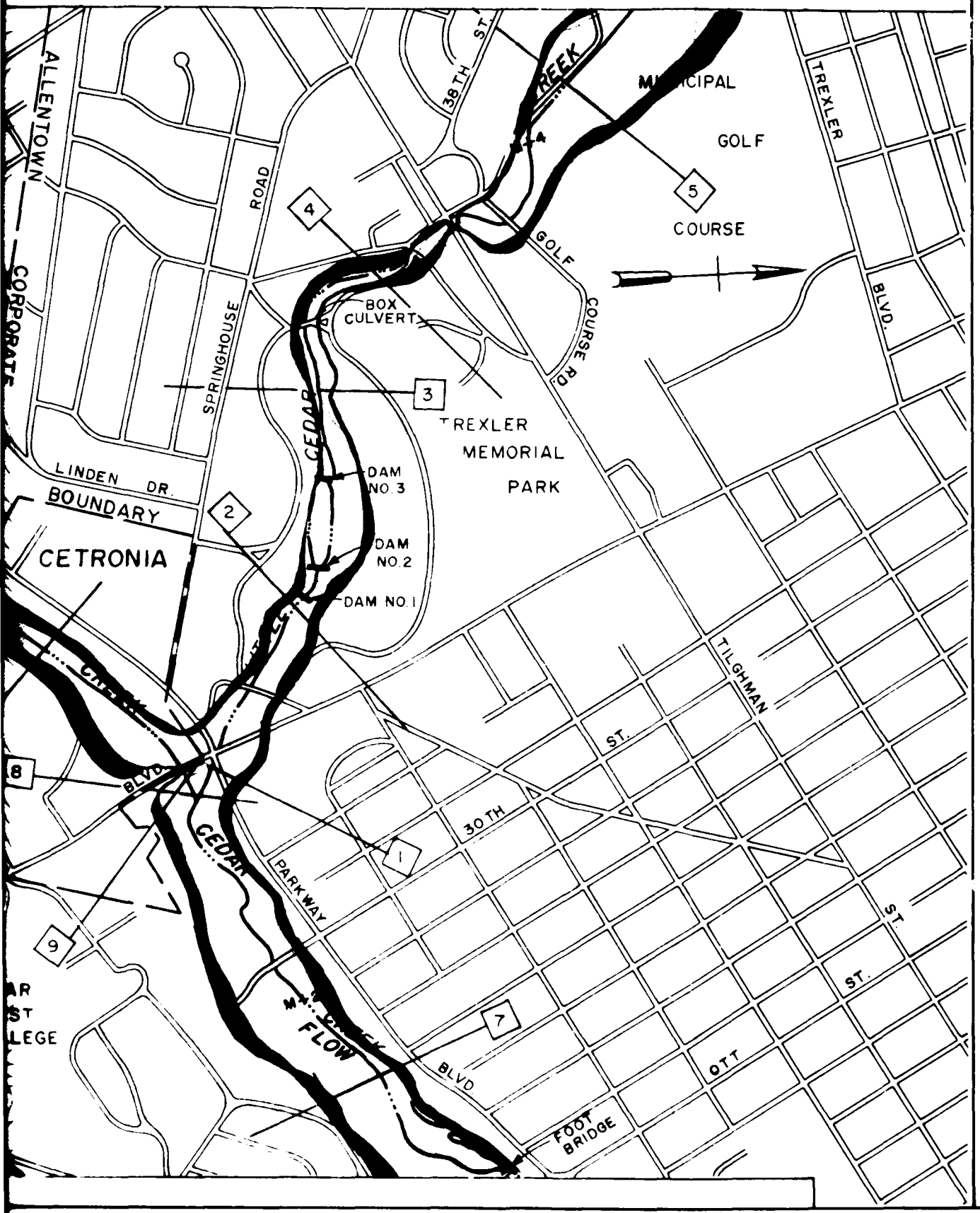
CITY OF ALLENTOWN
PENNSYLVANIA

FLOODED AREAS

OCTOBER 1972

PLATE 3


MATCH LINE PLATE 3
PA. RT. 309
DRIVE
ALLENTOWN
CORPORATE
DORNEY
PARK
DAM
NO. 4
DAM
NO. 3
DORNEY
PARK
BRIDGES
11
DORNEY
PARK
DAM
NO. 2
HAMILTON
ST.
BUNGALOW
PARK
DORNEYVILLE
MAIN
BLVD.
8
10
CREST
CEDAR
CEDAR
CREST
COLLEGE
MATCH LINE PLATE 5



OVER

INTE
REGI
FLOO

M+2 MILE

1 CROS

GROU
G.S.

CHAN

CITY

NOTES

1 MAP BASED ON U.S
ALLENTOWN EAST
MINOR ADDITIONS
CORPS OF ENGINE

2. LIMITS OF OVERF
ACTUAL LOCATION
THE REPORT.

3. AREAS OUTSIDE T
SUBJECT TO FLOO

4. MINIMUM CONTOUR

SC

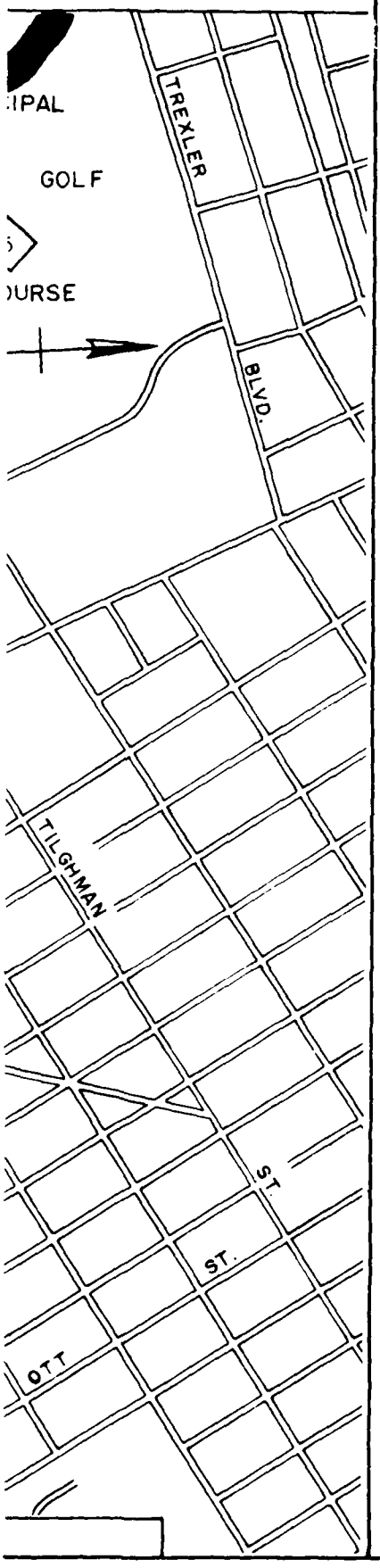
0

DEPART
PHILADELPHIA DIST
PHILADELPH

FLOOD PLA

CITY O
PENN

FLOO
OCT



LEGEND

OVERFLOW LIMITS

INTERMEDIATE REGIONAL FLOOD — STANDARD PROJECT FLOOD

M+2 MILES ABOVE MOUTH

1 CROSS SECTION

GROUND ELEVATION IN FEET (U.S.C.& G.S. 1929 ADJ.) SEA LEVEL DATUM

CHANNEL

CITY LIMITS

NOTES

1. MAP BASED ON U.S.G.S. 7.5 MIN. QUADRANGLE ALLENTOWN EAST AND ALLENTOWN WEST, 1964 MINOR ADDITIONS AND MODIFICATIONS MADE BY CORPS OF ENGINEERS.
2. LIMITS OF OVERFLOW SHOWN MAY VARY FROM ACTUAL LOCATION ON GROUND AS EXPLAINED IN THE REPORT.
3. AREAS OUTSIDE THE FLOOD PLAIN MAY BE SUBJECT TO FLOODING FROM LOCAL RUNOFF.
4. MINIMUM CONTOUR INTERVAL IS 10 FT.

SCALE IN FEET

0 800 1600

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

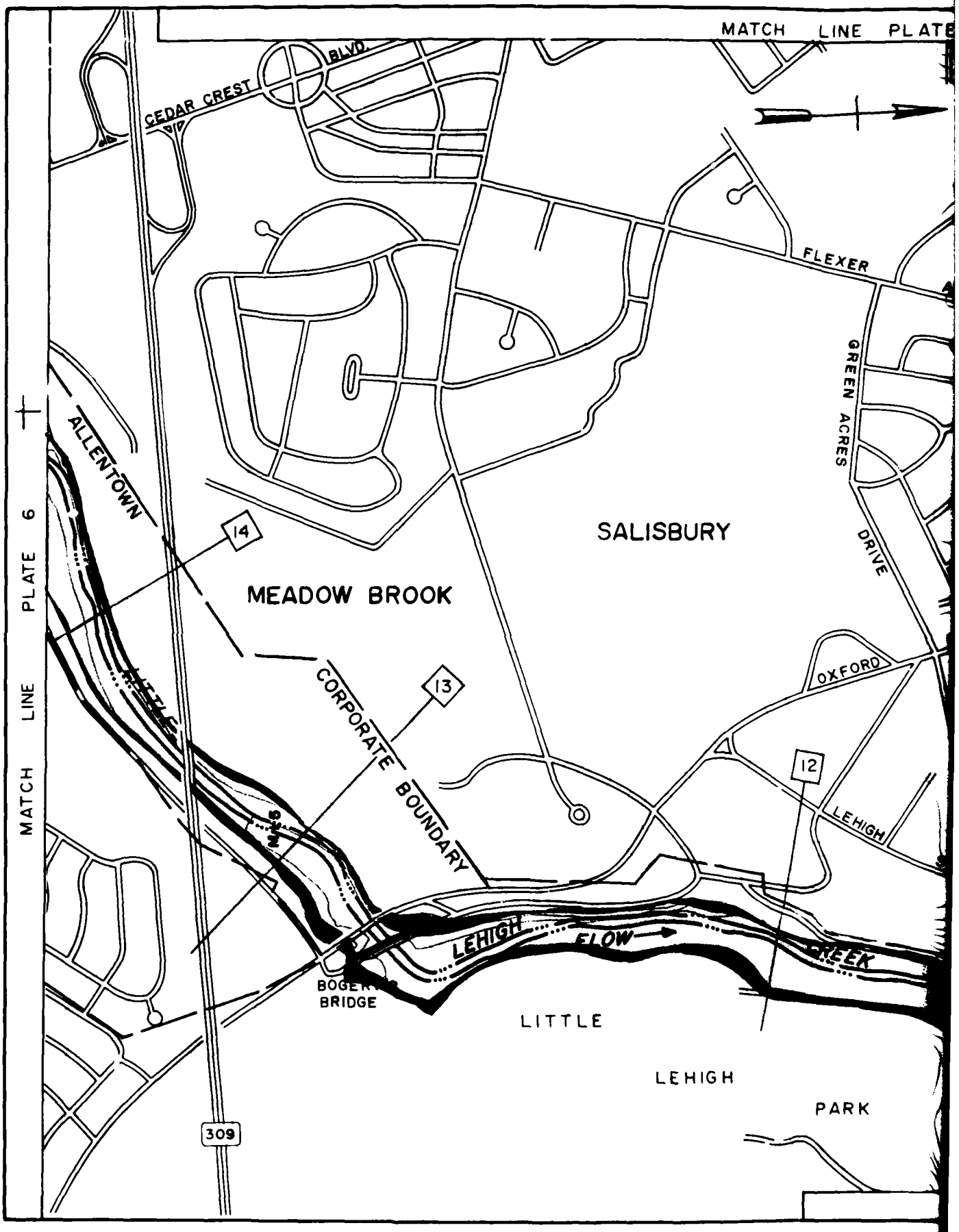
FLOOD PLAIN INFORMATION

CITY OF ALLENTOWN
PENNSYLVANIA

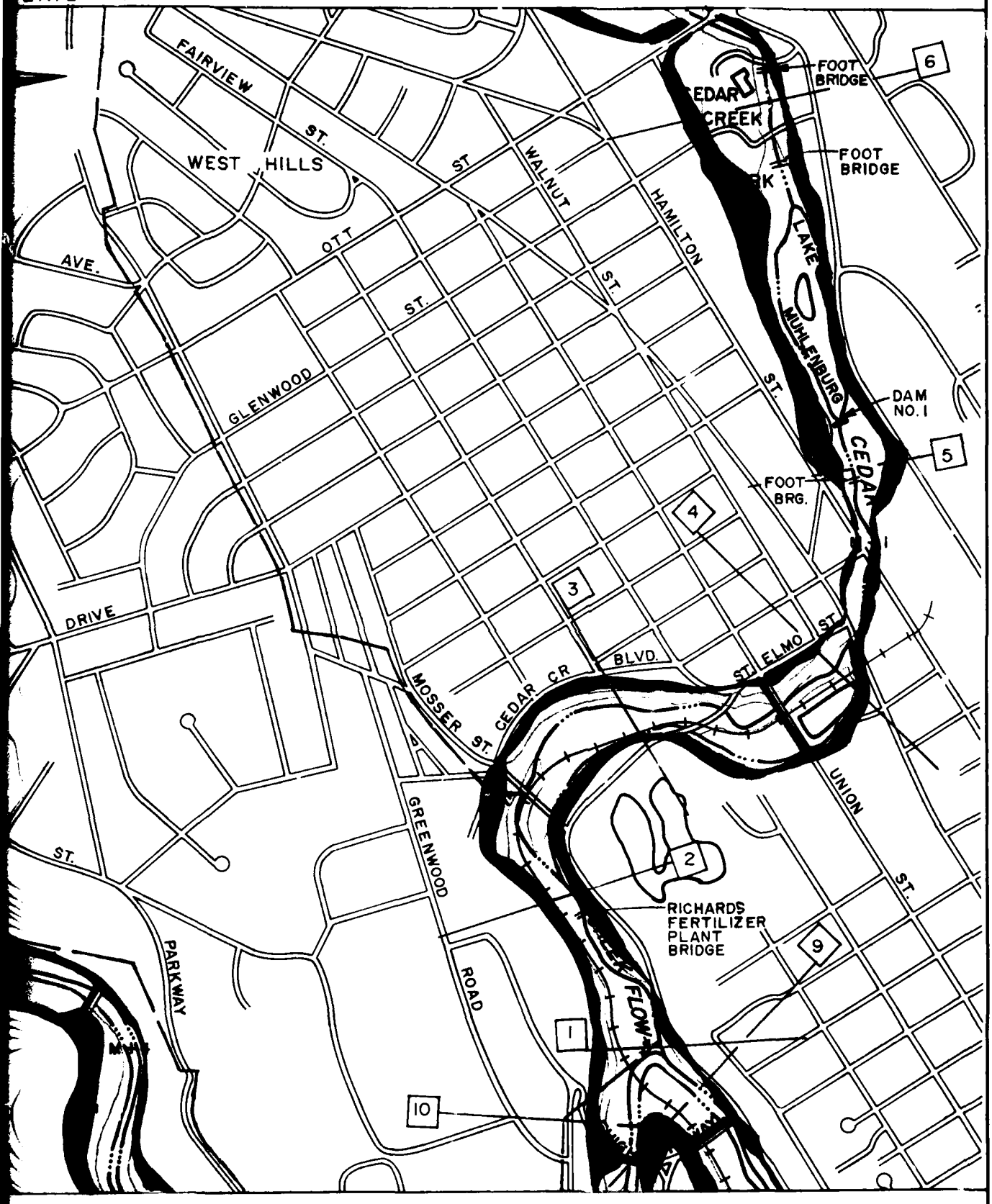
FLOODED AREAS

OCTOBER 1972

PLATE 4


MATCH LINE PLATE
BLVD.
CEDAR CREST
FLEXER
GREEN ACRES
DRIVE
ALLENTOWN
14
SALISBURY
MEADOW BROOK
MATCH LINE PLATE 6
CORPORATE BOUNDARY
13
OXFORD
12
LEHIGH
LEHIGH
FLOW
CREEK
BOGERT
BRIDGE
LITTLE
LEHIGH
PARK
309

LATE 4



MATCH LINE PLATE 7

L

OVERFL

INTERM
REGION
FLOOD

M+I MILES

1 CROSS

GROUN
G.S.

CHANN

CITY

NOTES

1 MAP BASED ON U.S.
ALLENTOWN EAST A
MINOR ADDITIONS
CORPS OF ENGINEE

2. LIMITS OF OVERFL
ACTUAL LOCATION
THE REPORT.

3. AREAS OUTSIDE TH
SUBJECT TO FLOOD

4. MINIMUM CONTOUR

SCA

0

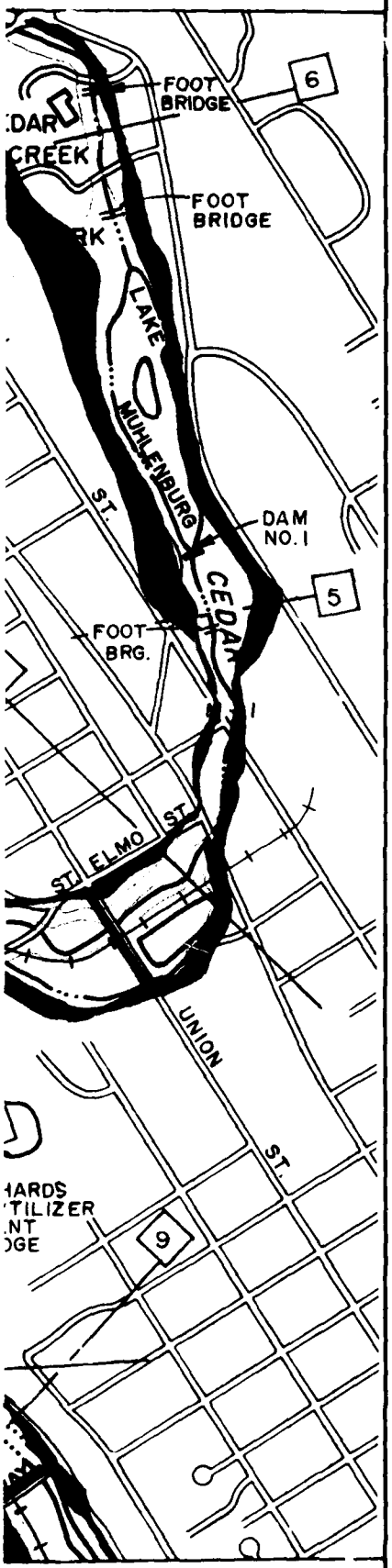
DEPARTM
PHILADELPHIA DIST
PHILADELPH

FLOOD PLA

CITY O
PENN

FLOOD

OCT



LEGEND

OVERFLOW LIMITS

INTERMEDIATE REGIONAL FLOOD — STANDARD PROJECT FLOOD

M+1 MILES ABOVE MOUTH

1 CROSS SECTION

GROUND ELEVATION IN FEET (U.S.C.& G.S. 1929 ADJ.) SEA LEVEL DATUM

CHANNEL

CITY LIMITS

NOTES

1. MAP BASED ON U.S.G.S. 7.5 MIN. QUADRANGLE ALLENTOWN EAST AND ALLENTOWN WEST, 1964 MINOR ADDITIONS AND MODIFICATIONS MADE BY CORPS OF ENGINEERS.
2. LIMITS OF OVERFLOW SHOWN MAY VARY FROM ACTUAL LOCATION ON GROUND AS EXPLAINED IN THE REPORT.
3. AREAS OUTSIDE THE FLOOD PLAIN MAY BE SUBJECT TO FLOODING FROM LOCAL RUNOFF.
4. MINIMUM CONTOUR INTERVAL IS 10 FT.

SCALE IN FEET

0 800 1600

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

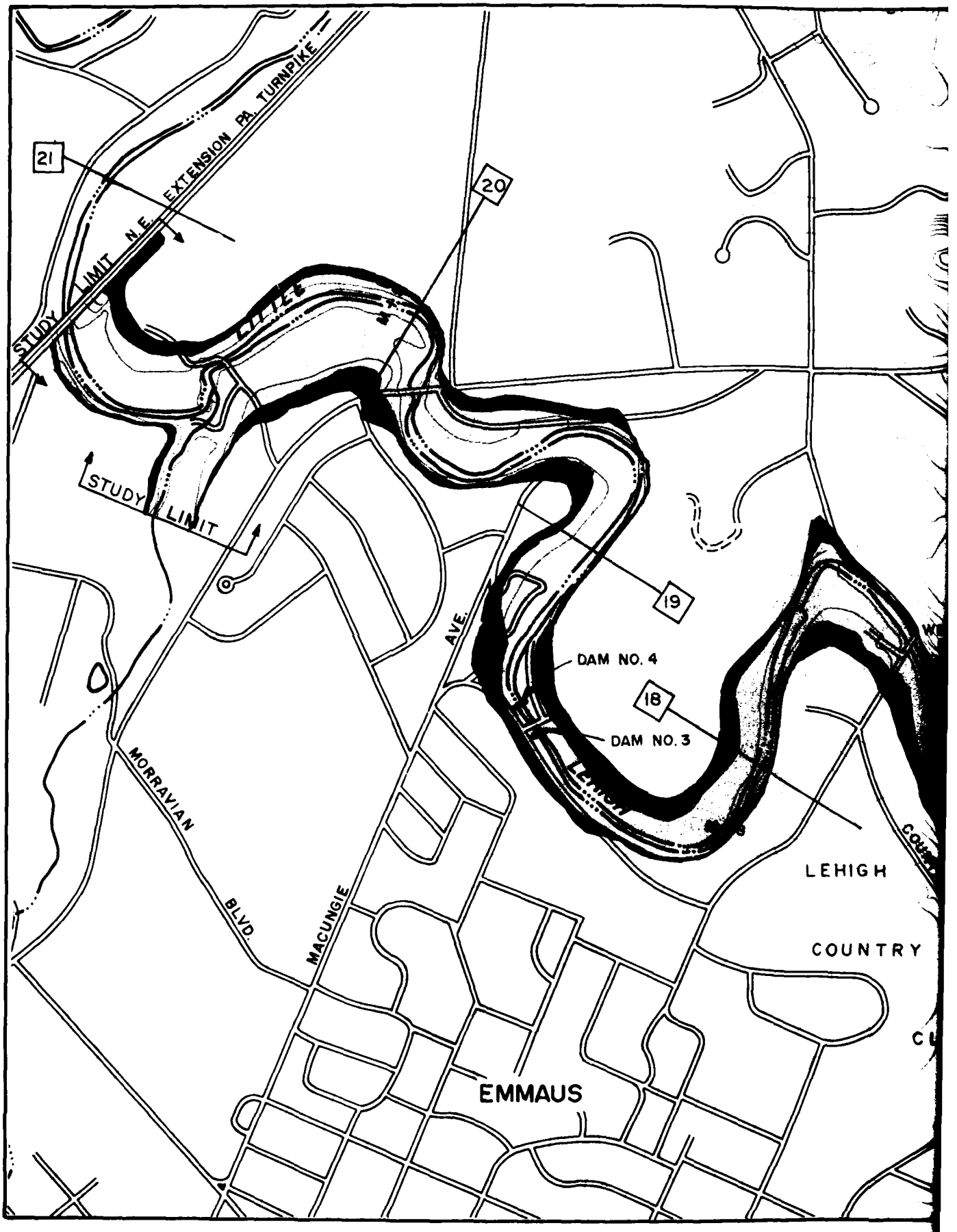
FLOOD PLAIN INFORMATION

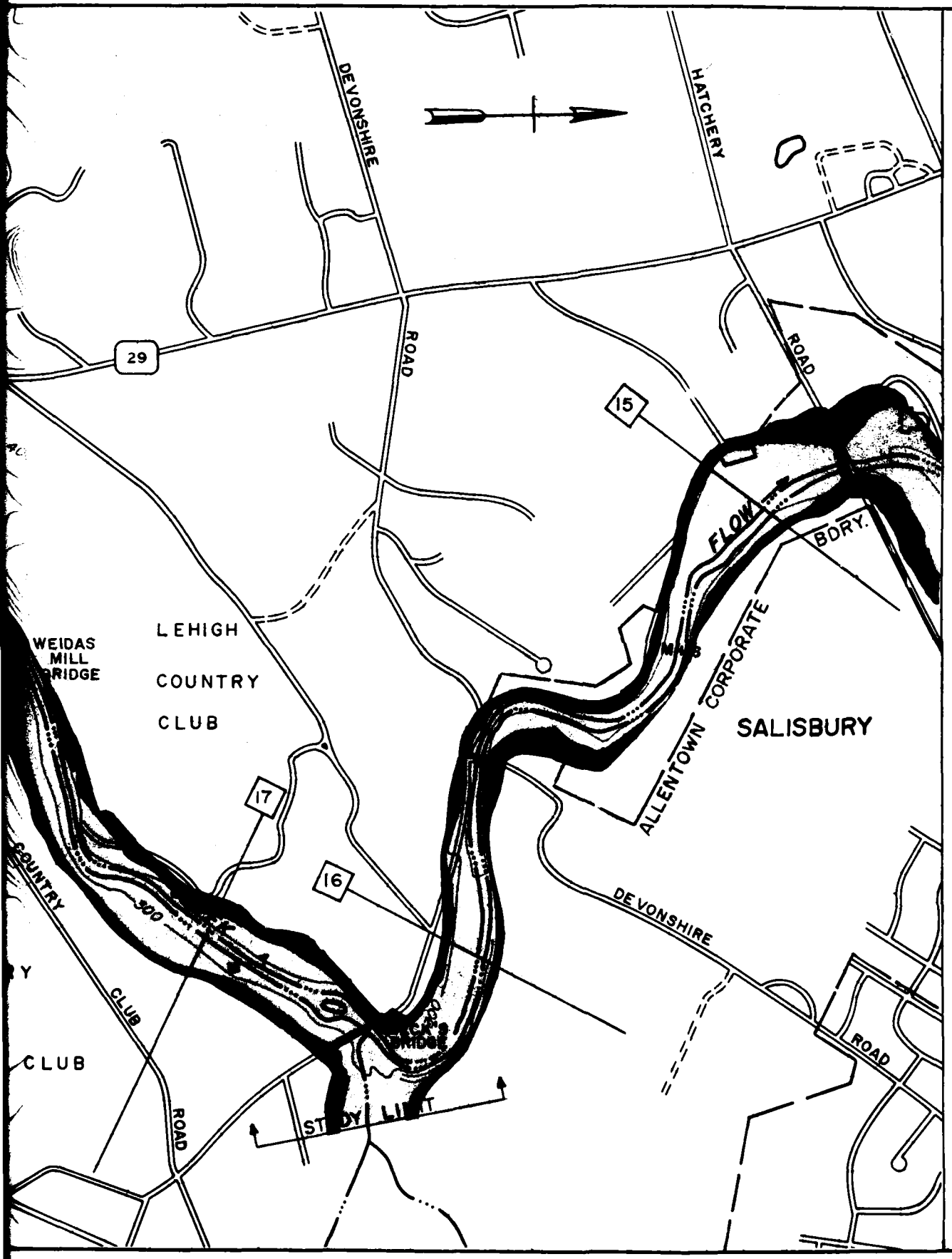
CITY OF ALLENTOWN
PENNSYLVANIA

FLOODED AREAS

OCTOBER 1972

PLATE 5


21
EXTENSION PA. TURNPIKE
STUDY LIMIT N.E.
20
STUDY LIMIT
19
DAM NO. 4
18
DAM NO. 3
AVE.
MORRAVIAN
BLVD.
MACUNGIE
LEHIGH
COUNTRY
EMMAUS



OVERF

INTER
REGIO
FLOOD

M+6 MILES

15 CROSS

GROUN
G.S.

CHANN

CITY

NOTES

1 MAP BASED ON U.S.
ALLENTOWN EAST A
MINOR ADDITIONS
CORPS OF ENGINEE

2. LIMITS OF OVERFL
ACTUAL LOCATION
THE REPORT.

3. AREAS OUTSIDE TH
SUBJECT TO FLOOD

4. MINIMUM CONTOUR

SCA

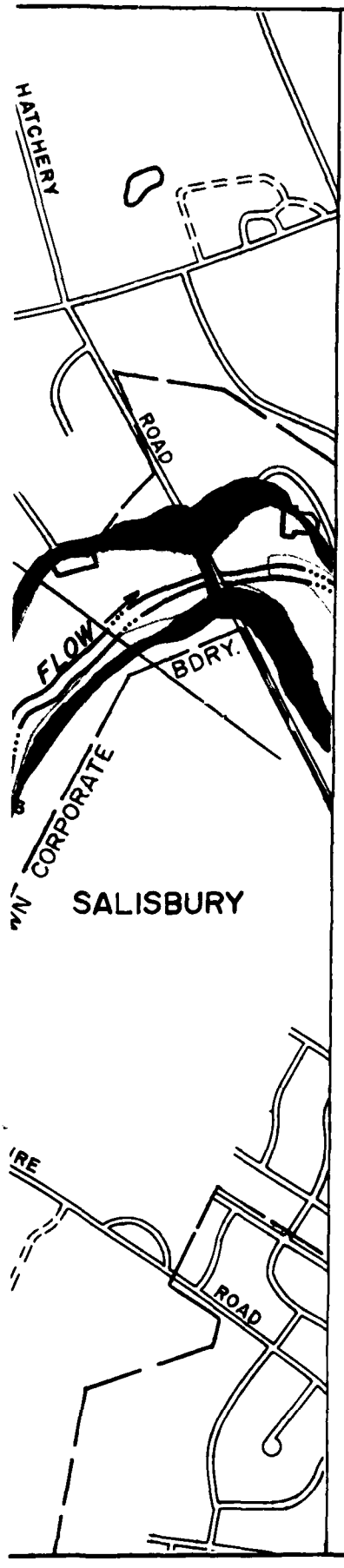
0

DEPARTM
PHILADELPHIA DIST
PHILADELPHI

FLOOD PLA

CITY O
PENN

FLOOD
OCT



MATCH LINE PLATE 5

LEGEND

OVERFLOW LIMITS

INTERMEDIATE REGIONAL FLOOD — STANDARD PROJECT FLOOD

M+6 MILES ABOVE MOUTH

15 CROSS SECTION

GROUND ELEVATION IN FEET (U.S.C.& G.S. 1929 ADJ.) SEA LEVEL DATUM

CHANNEL

CITY LIMITS

NOTES

1. MAP BASED ON U.S.G.S. 7.5 MIN. QUADRANGLE ALLENTOWN EAST AND ALLENTOWN WEST, 1964 MINOR ADDITIONS AND MODIFICATIONS MADE BY CORPS OF ENGINEERS.
2. LIMITS OF OVERFLOW SHOWN MAY VARY FROM ACTUAL LOCATION ON GROUND AS EXPLAINED IN THE REPORT.
3. AREAS OUTSIDE THE FLOOD PLAIN MAY BE SUBJECT TO FLOODING FROM LOCAL RUNOFF.
4. MINIMUM CONTOUR INTERVAL IS 10 FT.

SCALE IN FEET

0 800 1600

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

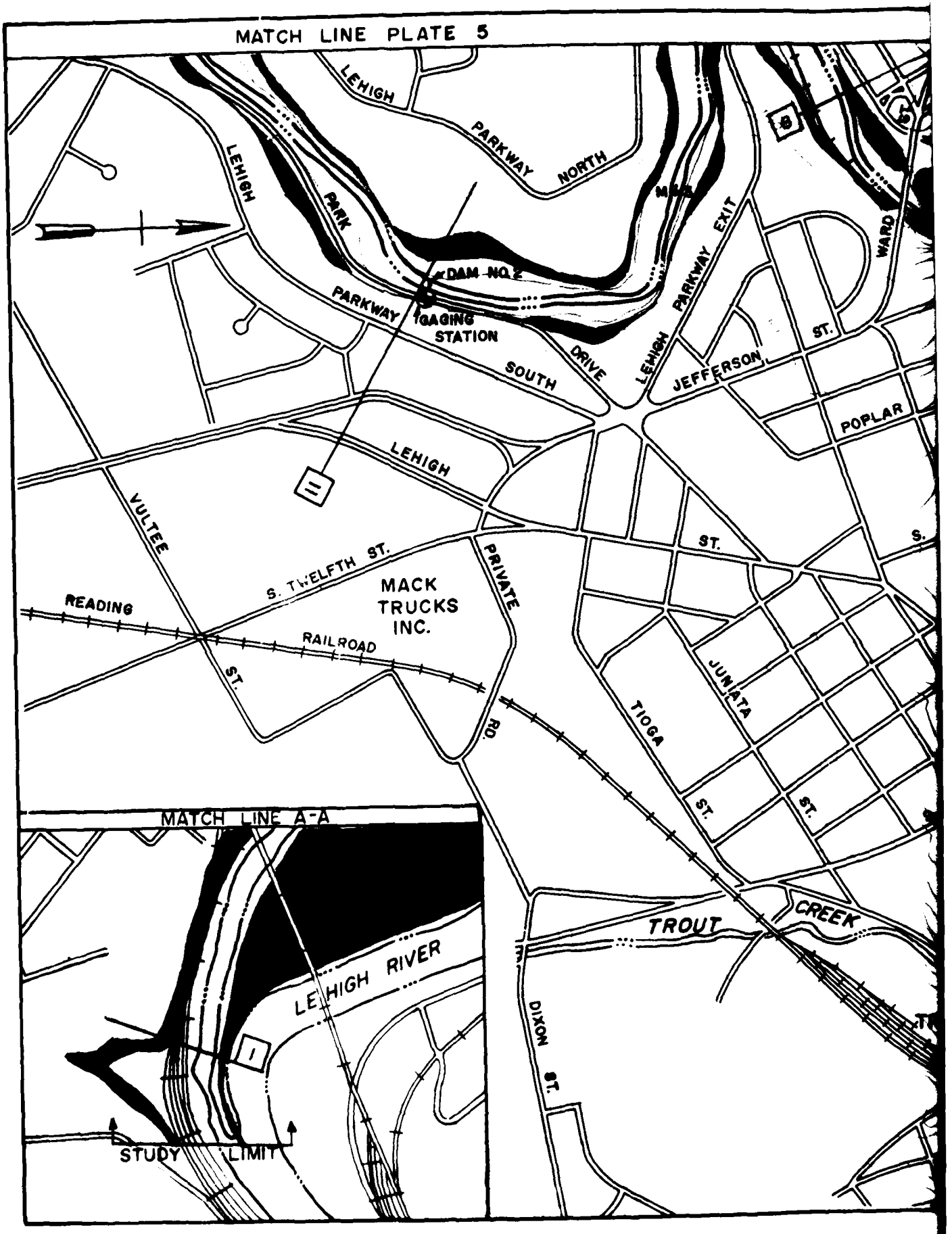
FLOOD PLAIN INFORMATION

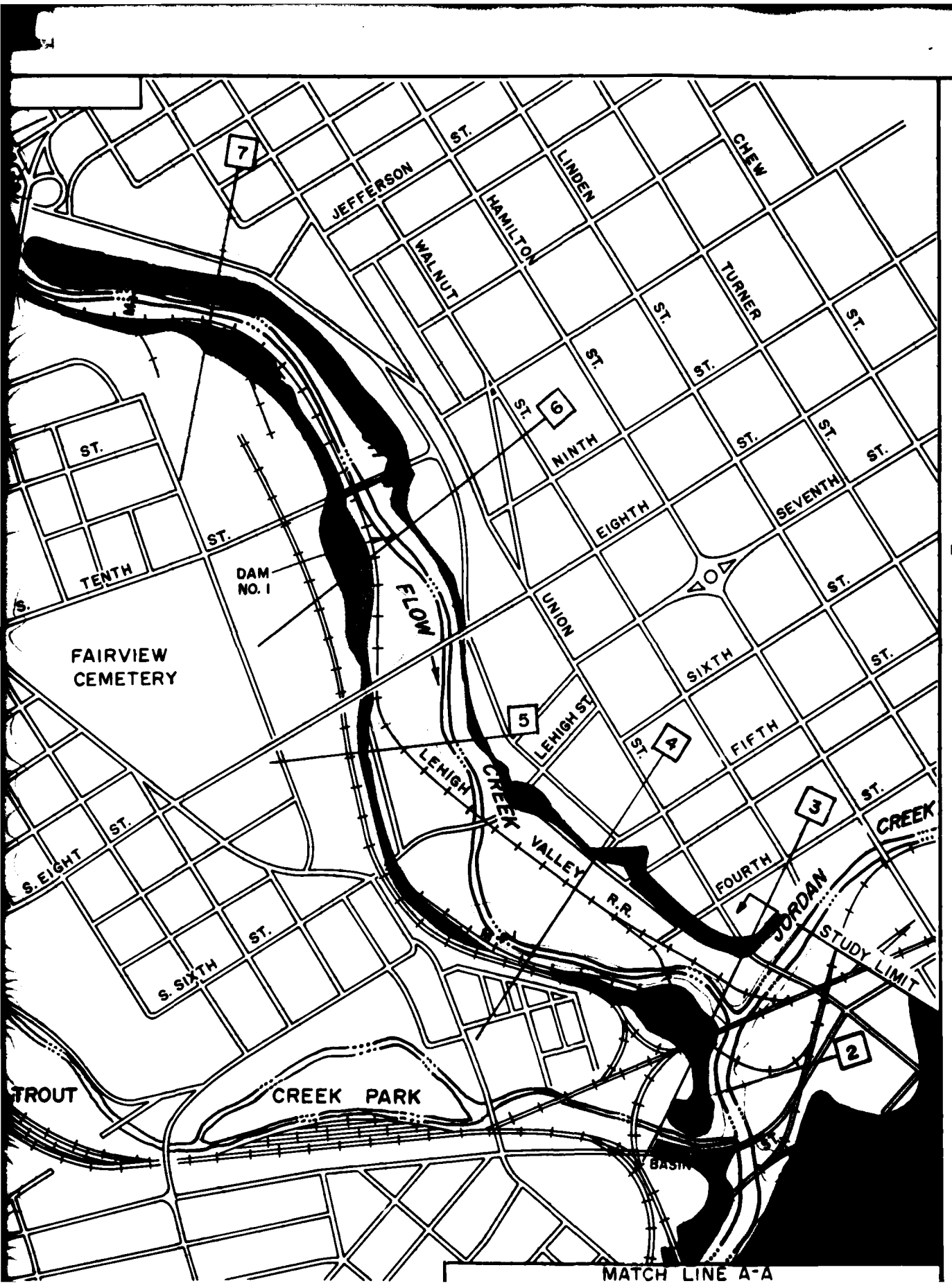
CITY OF ALLENTOWN
PENNSYLVANIA

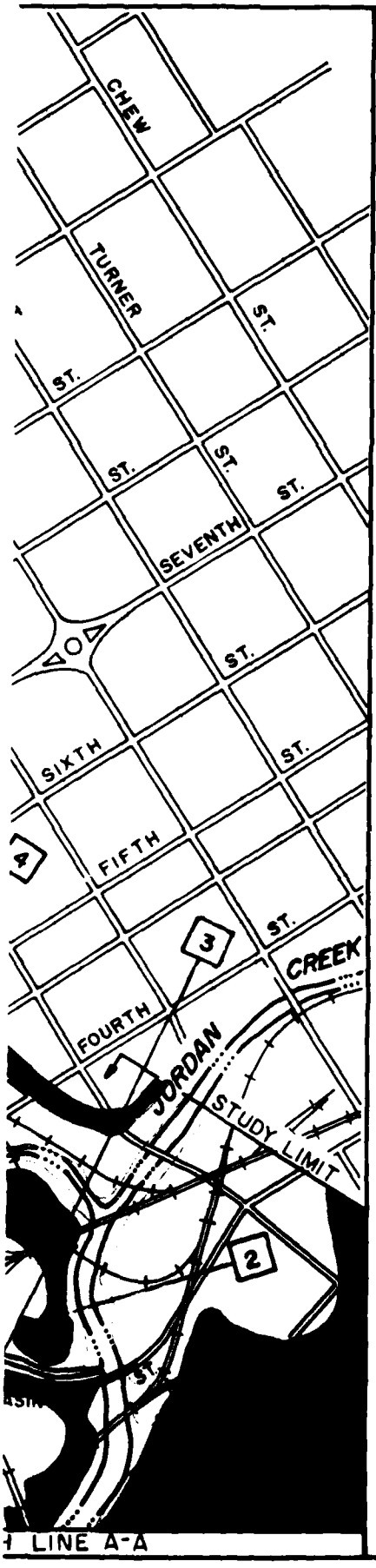
FLOODED AREAS

OCTOBER 1972

PLATE 6


MATCH LINE PLATE 5
LEHIGH
PARKWAY NORTH
LEHIGH
PARK
DAM NO. 2
PARKWAY
GAGING STATION
SOUTH
DRIVE
LEHIGH PARKWAY EXIT
WARD
JEFFERSON
ST.
POPLAR
LEHIGH
VULTEE
S. TWELFTH ST.
PRIVATE
MACK TRUCKS INC.
READING
RAILROAD
ST.
RD.
TIOGA
JUNIATA
ST.
ST.
MATCH LINE A-A
LEHIGH RIVER
TROUT
CREEK
DIXON ST.
STUDY LIMIT


JEFFERSON ST.
WALNUT
HAMILTON
LINDEN
CHEW
TURNER
NINTH
EIGHTH
SEVENTH
SIXTH
FIFTH
FOURTH
UNION
TENTH
S. EIGHT ST.
S. SIXTH ST.
DAM NO. 1
FLOW
FAIRVIEW CEMETERY
LEHIGH ST.
LEHIGH VALLEY R.R.
CREEK
JORDAN CREEK
STUDY LIMIT
TROUT CREEK PARK
BASIN
MATCH LINE A-A
7
6
5
4
3
2
OVERFL
INTERM
REGION
FLOOD
M+2 MILES
2 CROSS
GROUND
G.S.
CHANNE
CITY L
NOTES
1 MAP BASED ON U.S.
ALLENTOWN EAST AN
MINOR ADDITIONS
CORPS OF ENGINEE
2. LIMITS OF OVERFL
ACTUAL LOCATION
THE REPORT.
3. AREAS OUTSIDE TH
SUBJECT TO FLOOD
4. MINIMUM CONTOUR
SCA
0
DEPARTM
PHILADELPHIA DIST
PHILADELPHI
FLOOD PLA
CITY O
PENN
FLOOD
OCT



LEGEND

OVERFLOW LIMITS

INTERMEDIATE REGIONAL FLOOD — STANDARD PROJECT FLOOD

M+2 MILES ABOVE MOUTH

2 CROSS SECTION

GROUND ELEVATION IN FEET (U.S.C.& G.S. 1929 ADJ.) SEA LEVEL DATUM

CHANNEL

CITY LIMITS

NOTES

1. MAP BASED ON U.S.G.S. 7.5 MIN. QUADRANGLE ALLENTOWN EAST AND ALLENTOWN WEST, 1964 MINOR ADDITIONS AND MODIFICATIONS MADE BY CORPS OF ENGINEERS.
2. LIMITS OF OVERFLOW SHOWN MAY VARY FROM ACTUAL LOCATION ON GROUND AS EXPLAINED IN THE REPORT.
3. AREAS OUTSIDE THE FLOOD PLAIN MAY BE SUBJECT TO FLOODING FROM LOCAL RUNOFF.
4. MINIMUM CONTOUR INTERVAL IS 10 FT.

SCALE IN FEET

0 800 1600

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

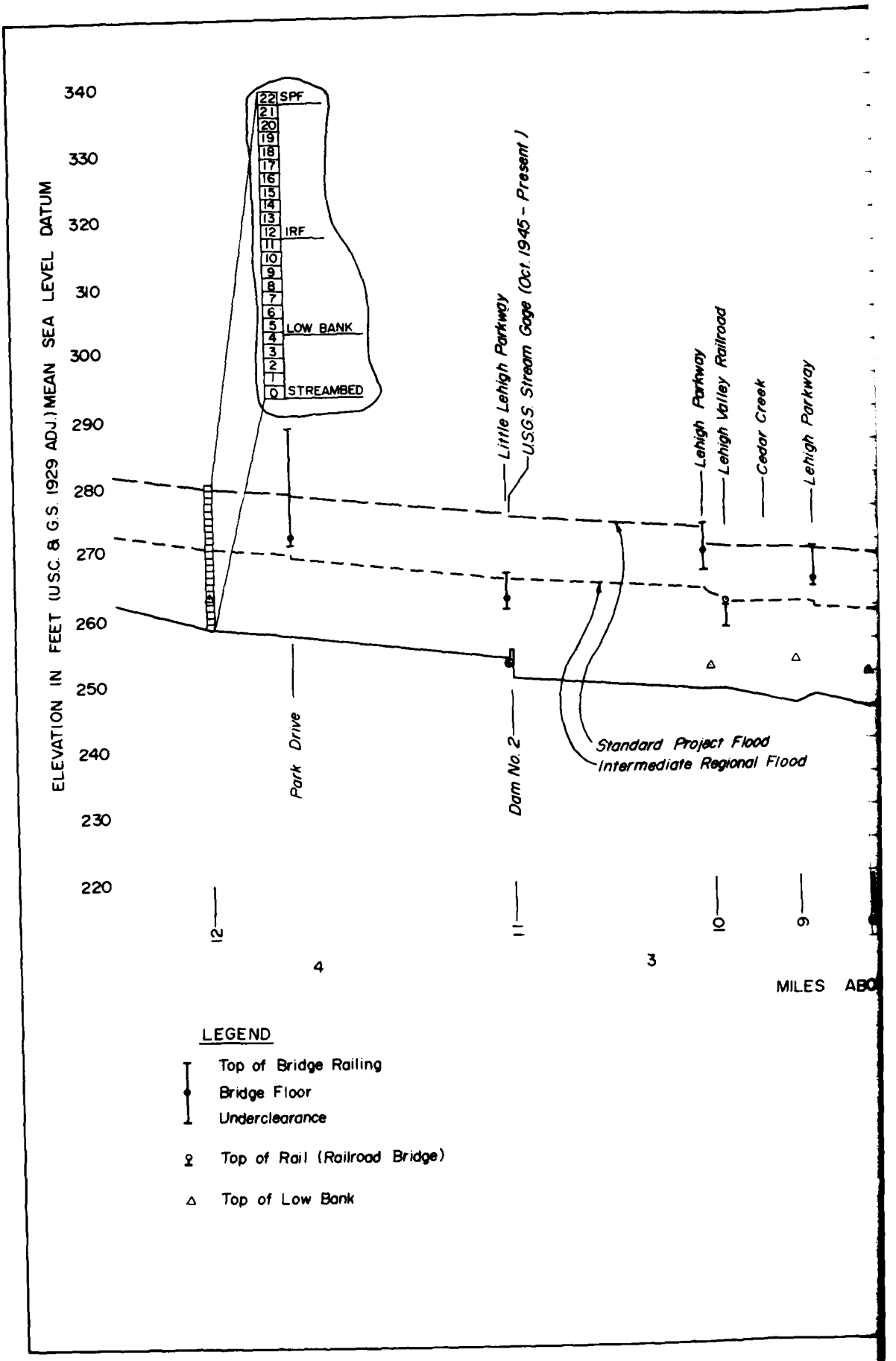
FLOOD PLAIN INFORMATION

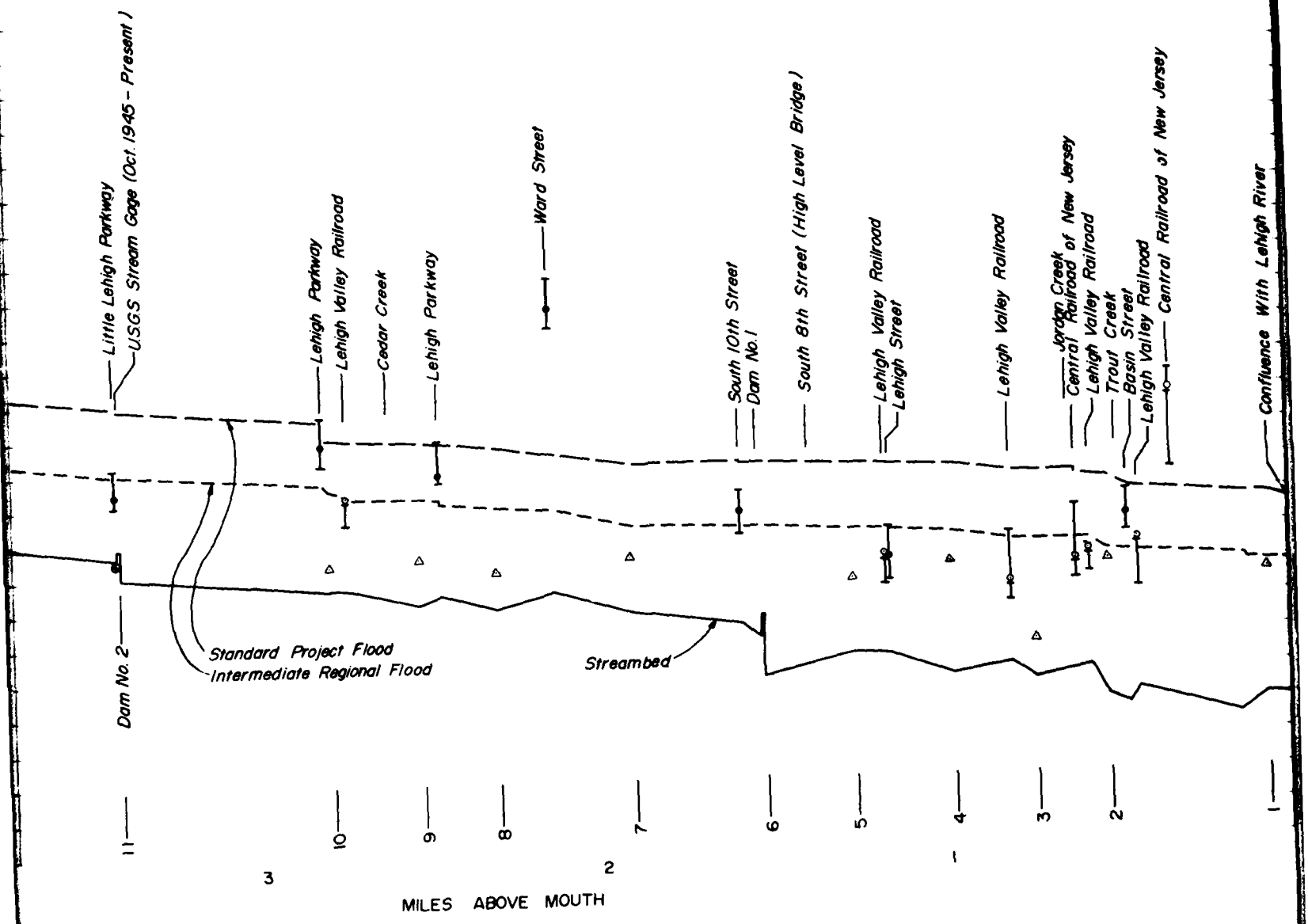
CITY OF ALLENTOWN
PENNSYLVANIA

FLOODED AREAS

OCTOBER 1972

PLATE 7


ELEVATION IN FEET (U.S.C. & G.S. 1929 ADJ.) MEAN SEA LEVEL DATUM
340
330
320
310
300
290
280
270
260
250
240
230
220
22 SPF
12 IRF
5 LOW BANK
0 STREAMBED
Little Lehigh Parkway
USGS Stream Gage (Oct. 1945 - Present)
Lehigh Parkway
Lehigh Valley Railroad
Cedar Creek
Lehigh Parkway
Park Drive
Dam No. 2
Standard Project Flood
Intermediate Regional Flood
12
11
10
9
4
3
MILES ABO
LEGEND
Top of Bridge Railing
Bridge Floor
Underclearance
Top of Rail (Railroad Bridge)
Top of Low Bank

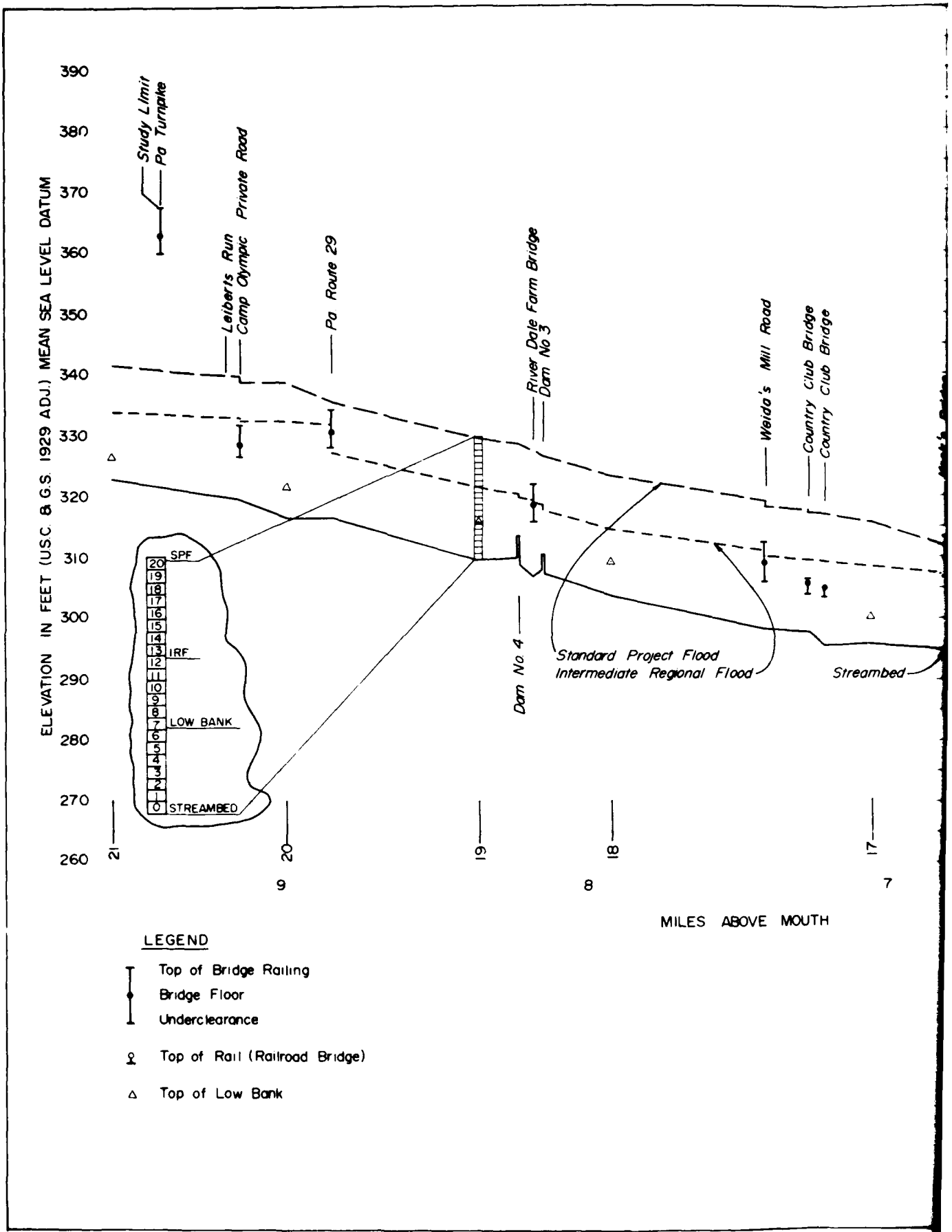


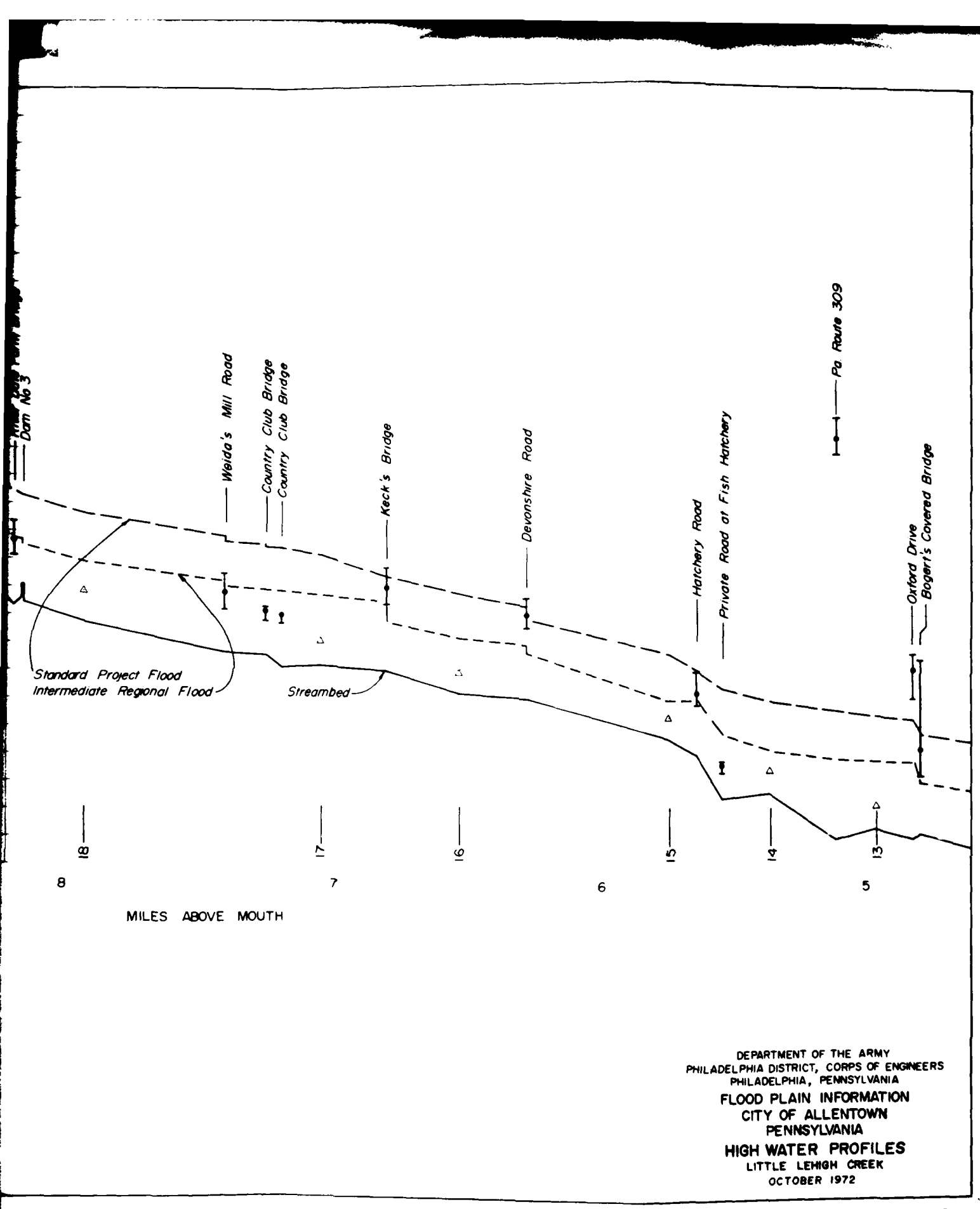
DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

FLOOD PLAIN INFORMATION
CITY OF ALLENTOWN
PENNSYLVANIA

HIGH WATER PROFILES
LITTLE LEHIGH CREEK
OCTOBER 1972

PLATE 8


ELEVATION IN FEET (USC & GS 1929 ADJ.) MEAN SEA LEVEL DATUM
390
380
370
360
350
340
330
320
310
300
290
280
270
260
Study Limit
Pa Turnpike
Leiberts Run
Camp Olympic
Private Road
Pa Route 29
River Dale Farm Bridge
Dam No 3
Weida's Mill Road
Country Club Bridge
Country Club Bridge
Dam No 4
SPF
IRF
LOW BANK
STREAMBED
Standard Project Flood
Intermediate Regional Flood
Streambed
21
20
19
18
17
9
8
7
MILES ABOVE MOUTH
LEGEND
Top of Bridge Railing
Bridge Floor
Underclearance
Top of Rail (Railroad Bridge)
Top of Low Bank

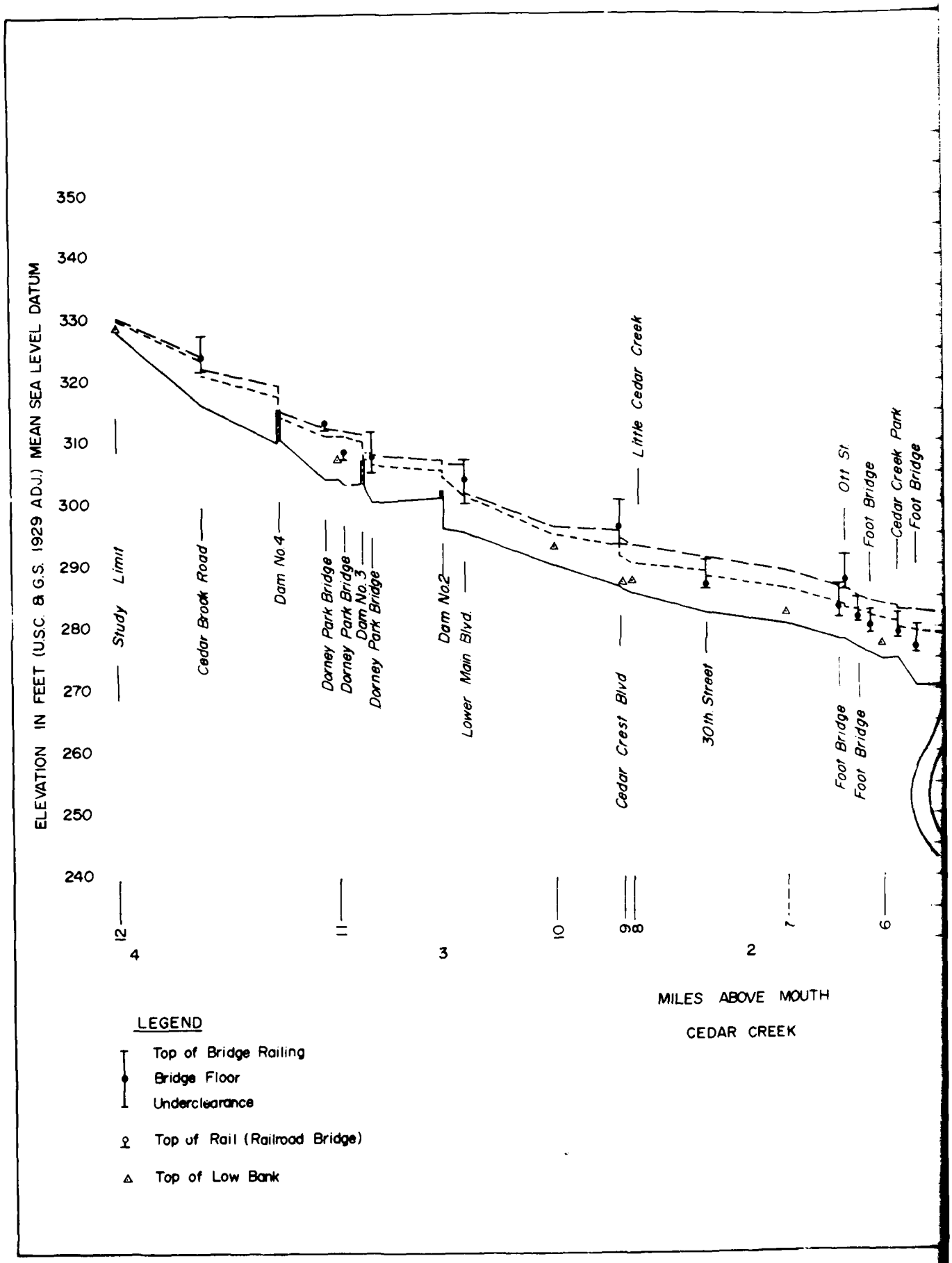


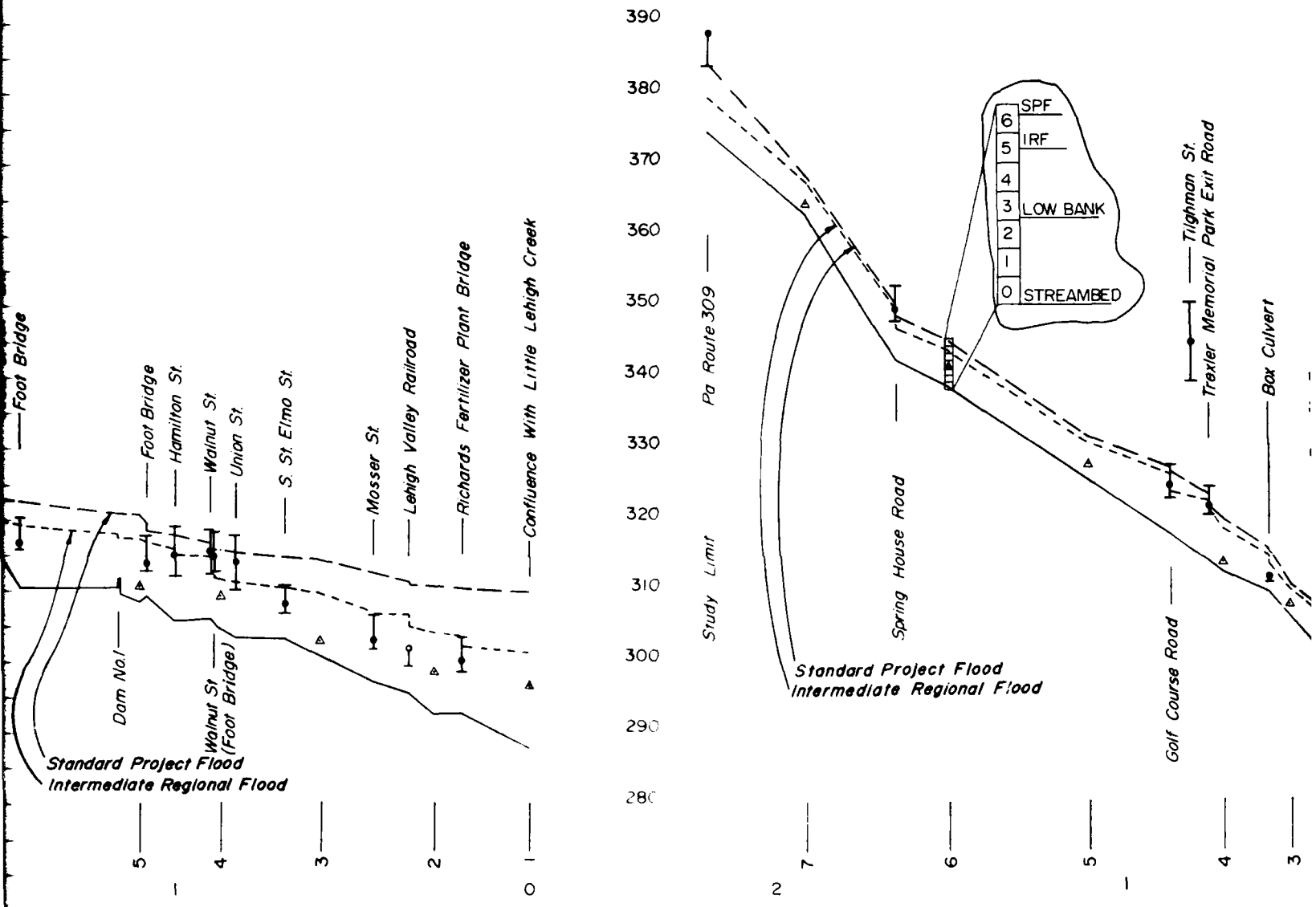
DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

FLOOD PLAIN INFORMATION
CITY OF ALLENTOWN
PENNSYLVANIA

HIGH WATER PROFILES
LITTLE LEHIGH CREEK
OCTOBER 1972

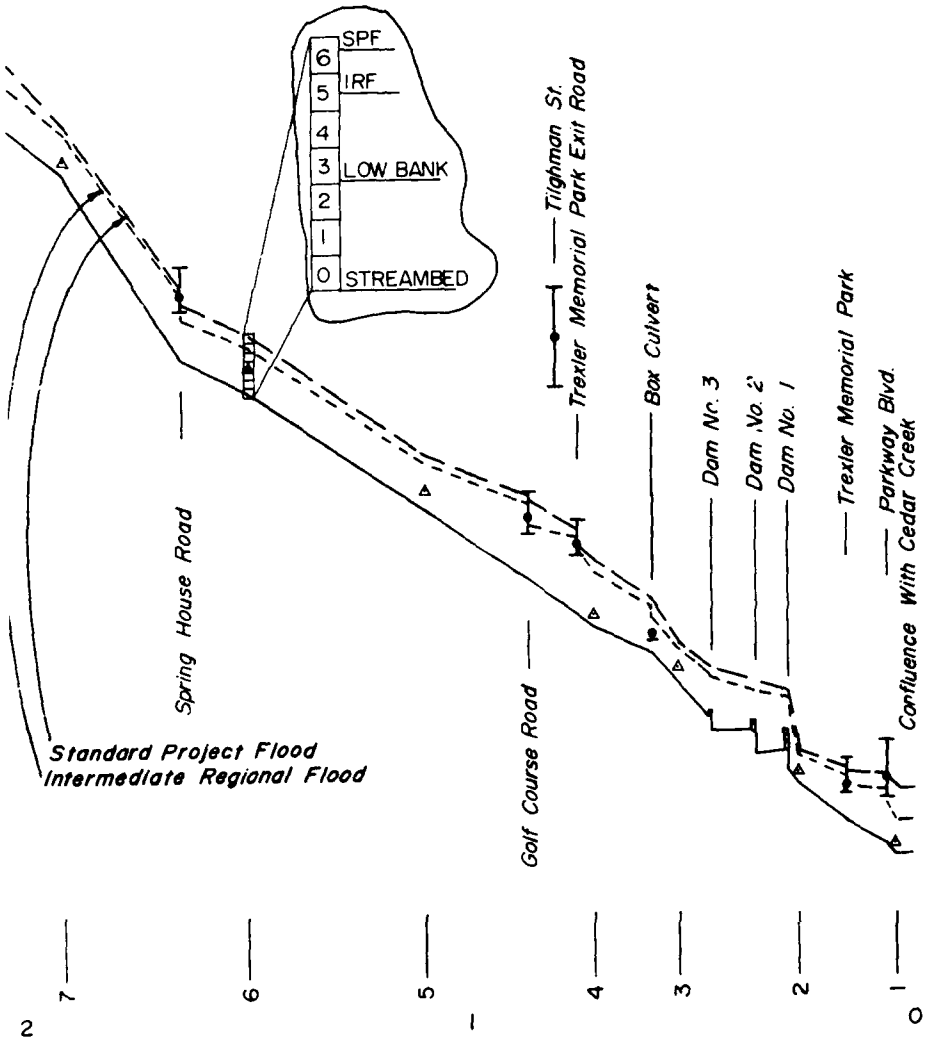
PLATE 9


ELEVATION IN FEET (U.S.C. & G.S. 1929 ADJ.) MEAN SEA LEVEL DATUM
350
340
330
320
310
300
290
280
270
260
250
240
Study Limit
Cedar Brook Road
Dam No.4
Dorney Park Bridge
Dorney Park Bridge
Dam No.3
Dorney Park Bridge
Dam No.2
Lower Main Blvd.
Little Cedar Creek
Cedar Crest Blvd
30th Street
Foot Bridge
Foot Bridge
Old St.
Foot Bridge
Cedar Creek Park
Foot Bridge
12
11
10
9
8
7
6
4
3
2
MILES ABOVE MOUTH
CEDAR CREEK
LEGEND
Top of Bridge Railing
Bridge Floor
Underclearance
Top of Rail (Railroad Bridge)
Top of Low Bank



DEPA
PHILADELPHIA
PHILA
FLOOD
CIT

HIGH
LITTLE CE

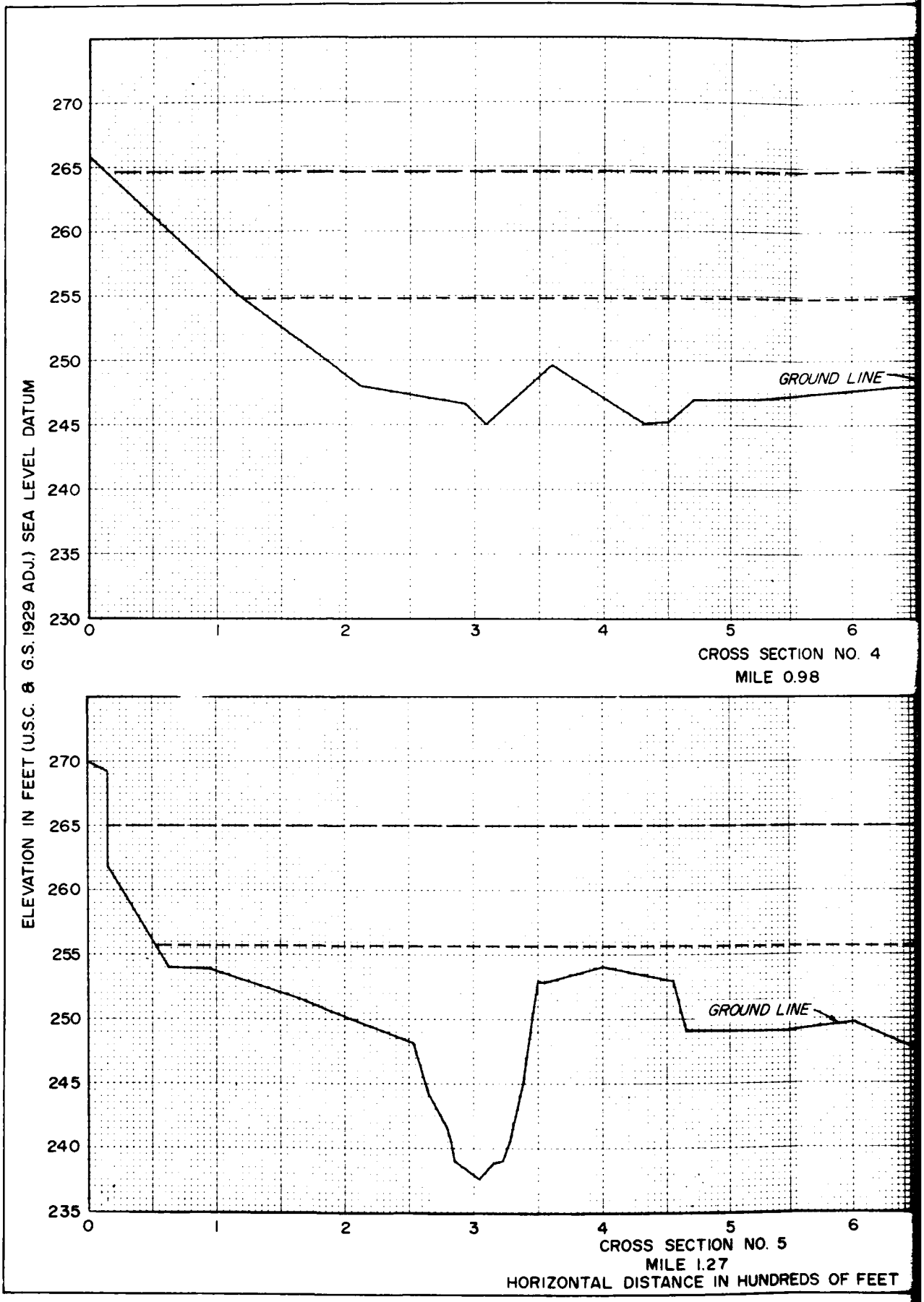


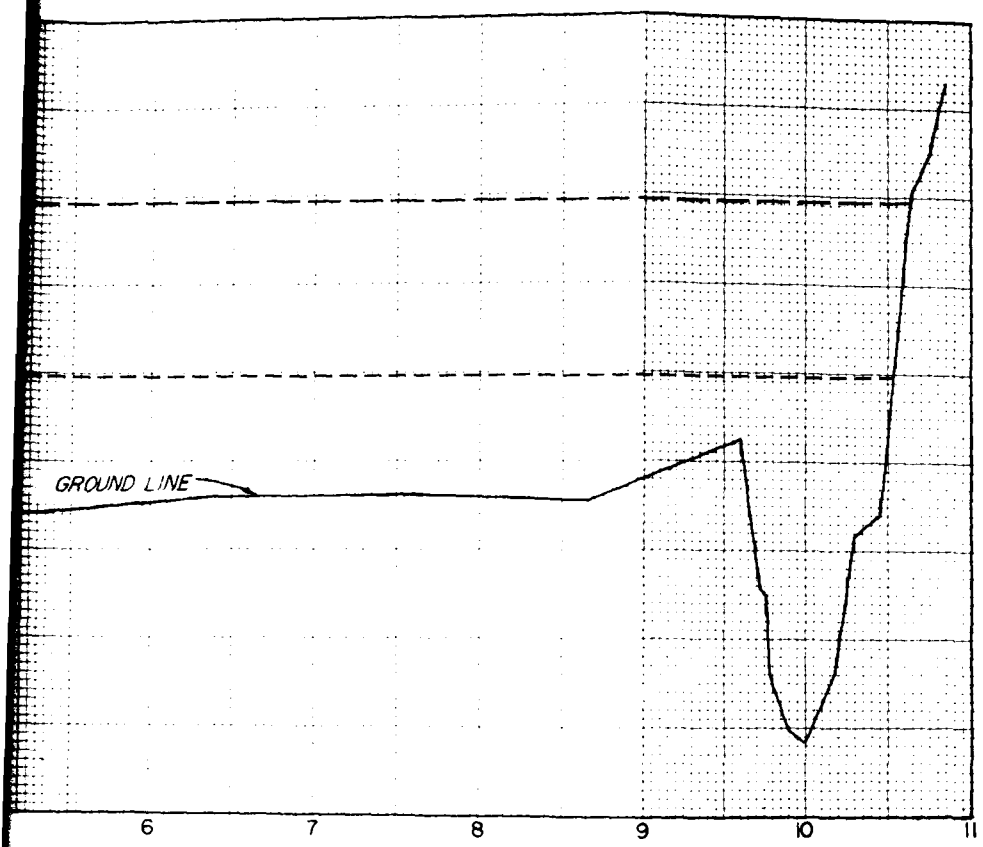
DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

FLOOD PLAIN INFORMATION
CITY OF ALLENTOWN
PENNSYLVANIA

HIGH WATER PROFILES
LITTLE CEDAR CREEK & CEDAR CREEK
OCTOBER 1972

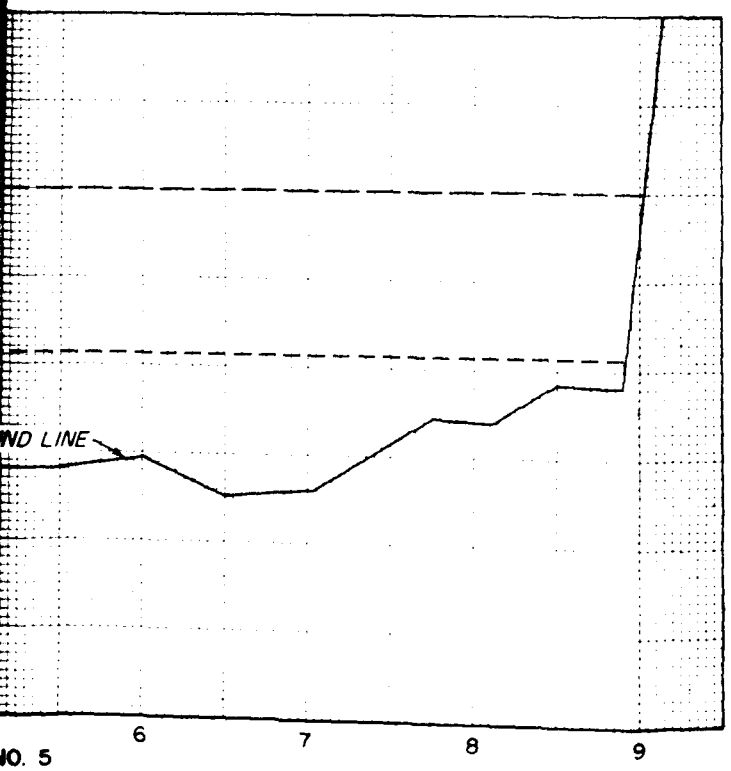
PLATE 10


ELEVATION IN FEET (U.S.C. & G.S. 1929 ADJ.) SEA LEVEL DATUM
270
265
260
255
250
245
240
235
230
0
1
2
3
4
5
6
GROUND LINE
CROSS SECTION NO. 4
MILE 0.98
GROUND LINE
CROSS SECTION NO. 5
MILE 1.27
HORIZONTAL DISTANCE IN HUNDREDS OF FEET



SECTION NO. 4

LE 0.98



IO. 5

UNDREDS OF FEET

LEGEND

——— Standard Project Flood

– – – – Intermediate Regional Flood

NOTES:

The 13 cross sections on Little Lehigh Creek not shown in this report are on file at the Philadelphia District, Corps of Engineers and are are available for inspection upon request.

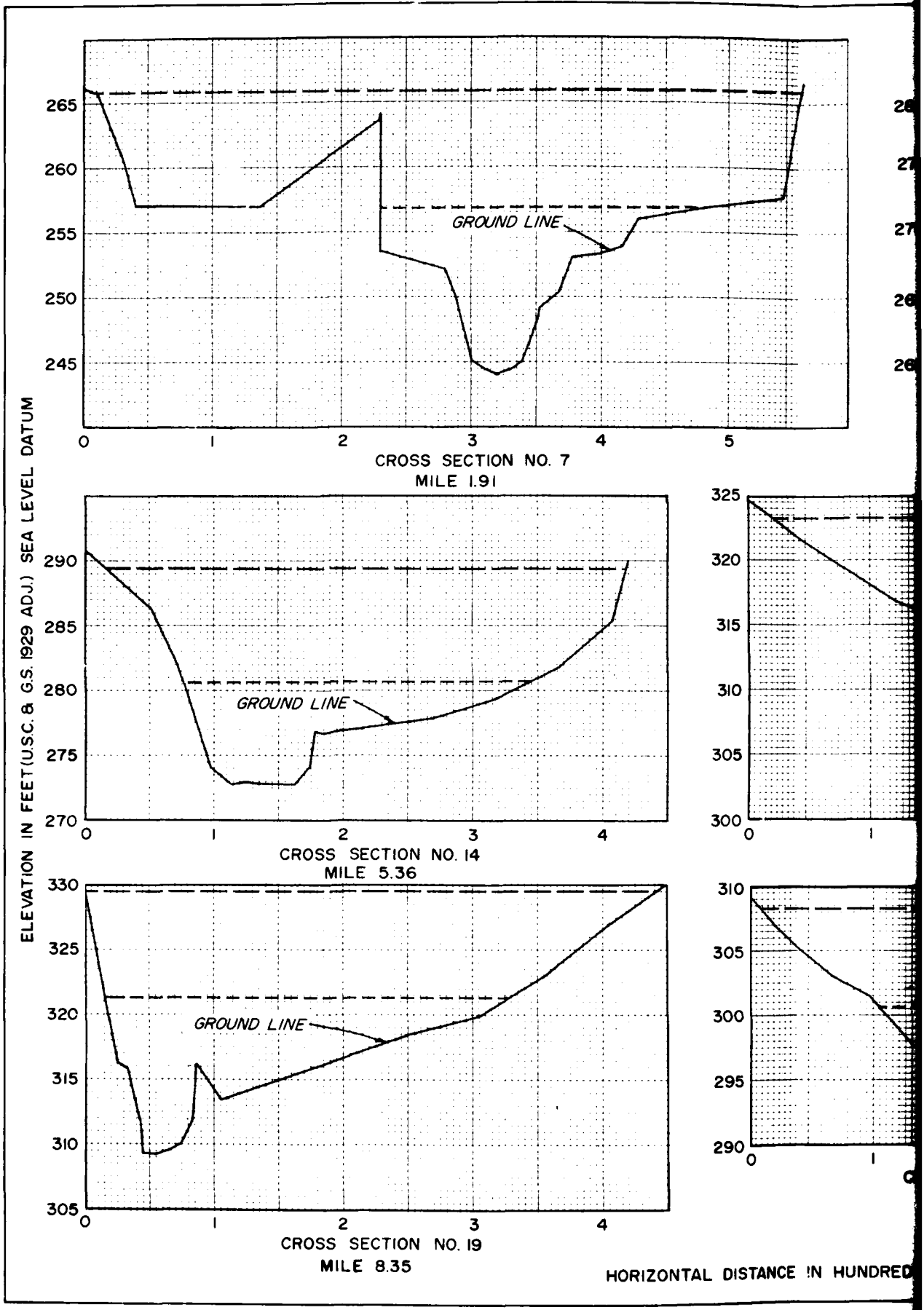
Sections taken looking downstream.

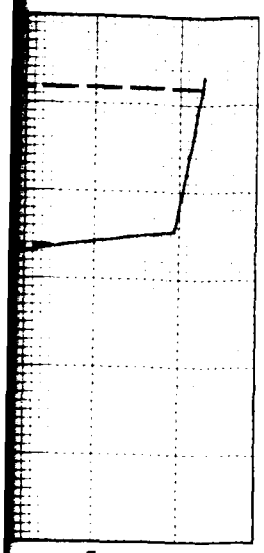
DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

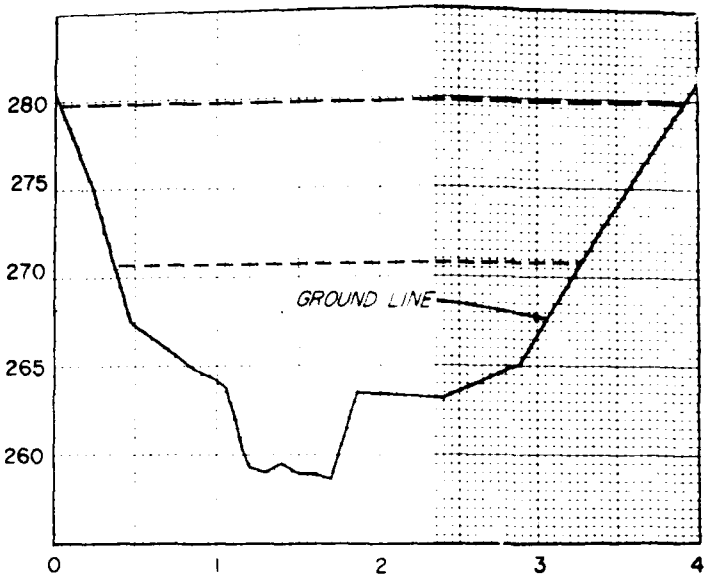
FLOOD PLAIN INFORMATION
CITY OF ALLENTOWN
PENNSYLVANIA

SELECTED CROSS SECTIONS
LITTLE LEHIGH CREEK
OCTOBER 1972

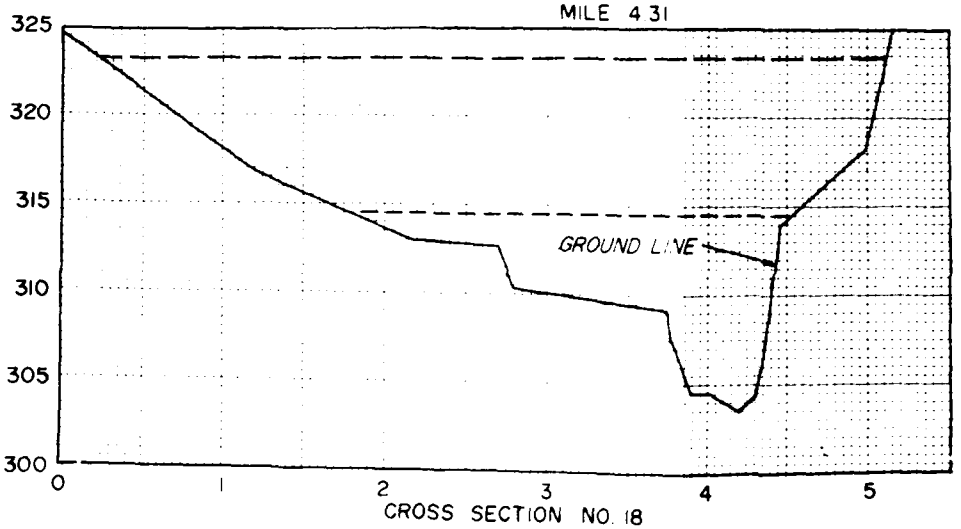
PLATE 11


ELEVATION IN FEET (U.S.C. & G.S. 1929 ADJ.) SEA LEVEL DATUM
265
260
255
250
245
GROUND LINE
0
1
2
3
4
5
CROSS SECTION NO. 7
MILE 1.91
290
285
280
275
270
GROUND LINE
0
1
2
3
4
CROSS SECTION NO. 14
MILE 5.36
330
325
320
315
310
305
GROUND LINE
0
1
2
3
4
CROSS SECTION NO. 19
MILE 8.35
325
320
315
310
305
300
310
305
300
295
290
HORIZONTAL DISTANCE IN HUNDRED

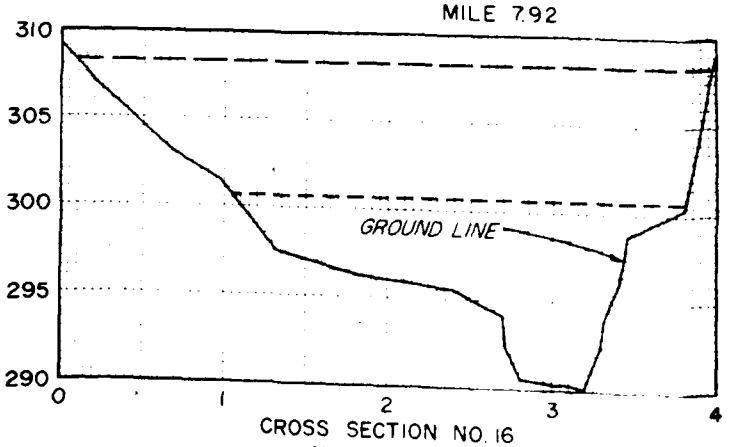




CROSS SECTION NO. 12
MILE 4.31



CROSS SECTION NO. 18
MILE 7.92



CROSS SECTION NO. 16
MILE 6.53

NTAL DISTANCE IN HUNDREDS OF FEET

LEGEND

——— Standard Project Flood
– – – – Intermediate Regional Flood

NOTES:

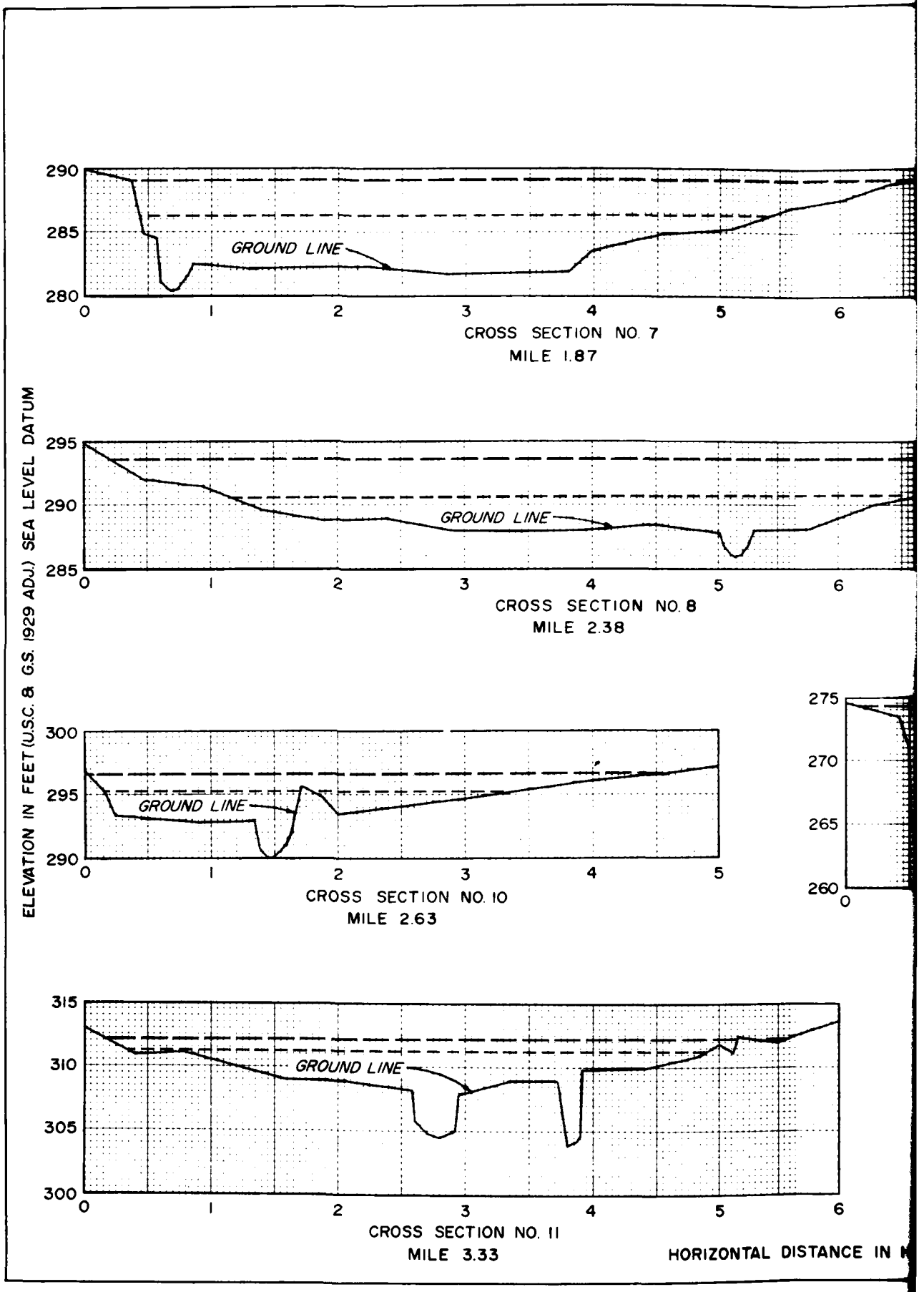
The 13 sections on Little Lehigh Creek not shown in this report are on file at the Philadelphia District, Corps of Engineers and are available for inspection upon request.

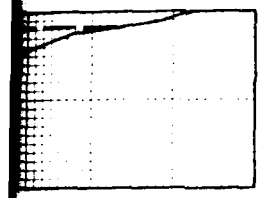
Sections taken looking downstream.

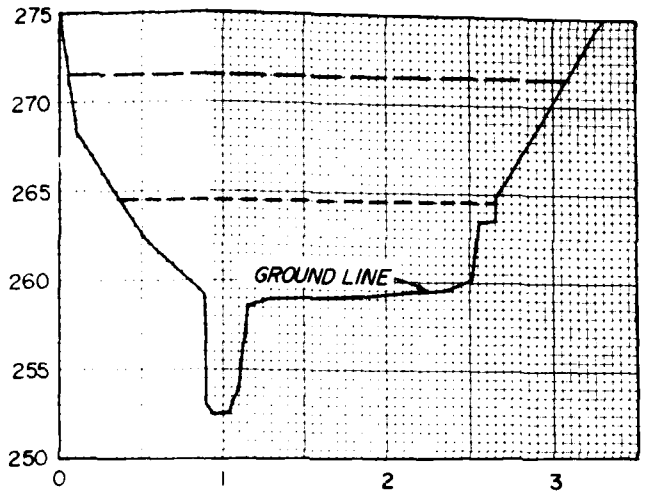
DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

FLOOD PLAIN INFORMATION
CITY OF ALLENTOWN
PENNSYLVANIA
SELECTED CROSS SECTIONS
LITTLE LEHIGH CREEK
OCTOBER 1972

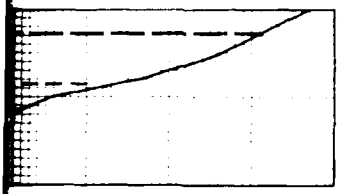
PLATE 12


ELEVATION IN FEET (U.S.C. & G.S. 1929 ADJ.) SEA LEVEL DATUM
290
285
280
GROUND LINE
0 1 2 3 4 5 6
CROSS SECTION NO. 7
MILE 1.87
295
290
285
GROUND LINE
0 1 2 3 4 5 6
CROSS SECTION NO. 8
MILE 2.38
300
295
290
GROUND LINE
0 1 2 3 4 5
CROSS SECTION NO. 10
MILE 2.63
275
270
265
260
0
315
310
305
300
GROUND LINE
0 1 2 3 4 5 6
CROSS SECTION NO. 11
MILE 3.33
HORIZONTAL DISTANCE IN





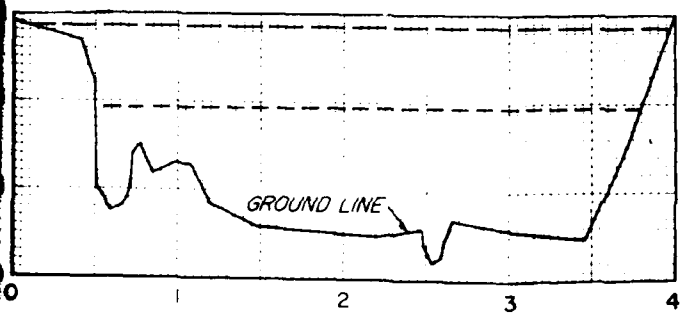
CROSS SECTION NO. 2
MILE 0.27



NOTES:

The 6 sections on Cedar Creek not shown in this report are on file at the Philadelphia District, Corps of Engineers and are available for inspection upon request.

Sections taken looking downstream.



CROSS SECTION NO. 3
MILE 0.59

LEGEND

—— Standard Project Flood

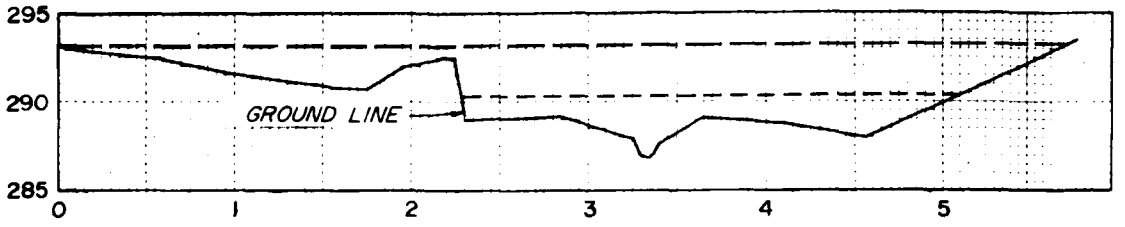
– – – Intermediate Regional Flood

CE IN HUNDREDS OF FEET

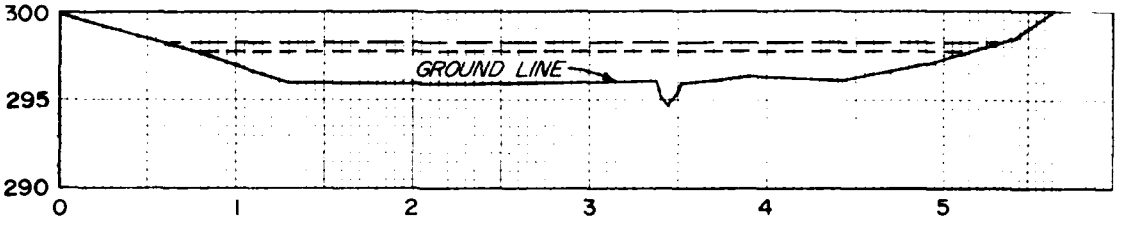
DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

FLOOD PLAIN INFORMATION
CITY OF ALLENTOWN
PENNSYLVANIA
SELECTED CROSS SECTIONS
CEDAR CREEK
OCTOBER 1972

PLATE 13

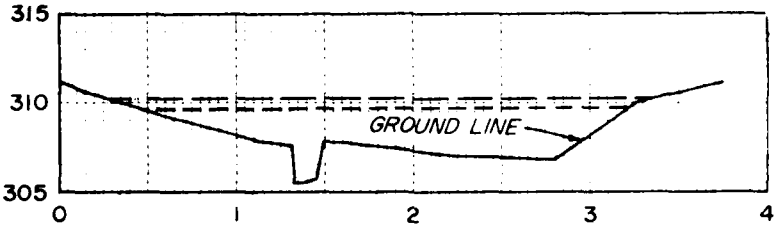


CROSS SECTION NO. 1
MILE 0.04

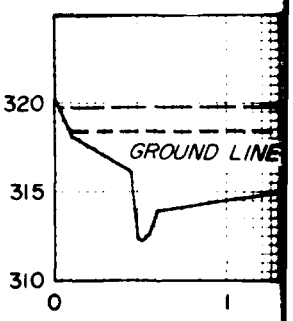


CROSS SECTION NO. 2
MILE 0.26

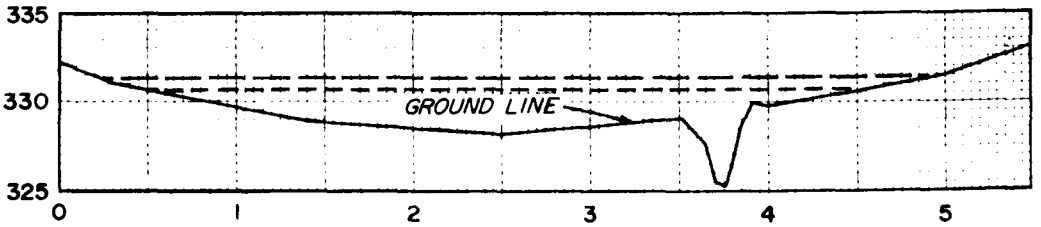
ELEVATION IN FEET (U.S.C. & G.S. 1929 ADJ.) SEA LEVEL DATUM.



CROSS SECTION NO. 3
MILE 0.53

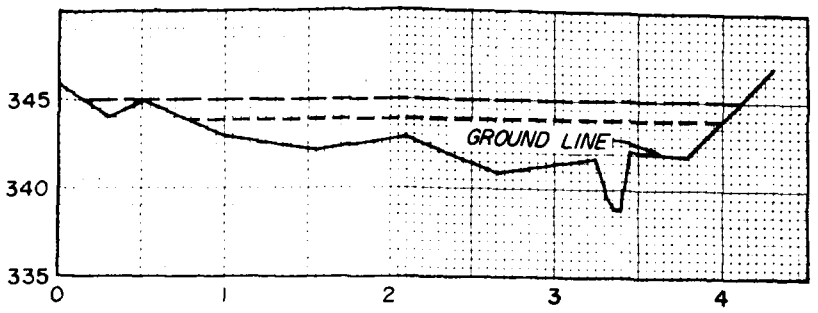


CROSS SECTIO
MILE 0.72

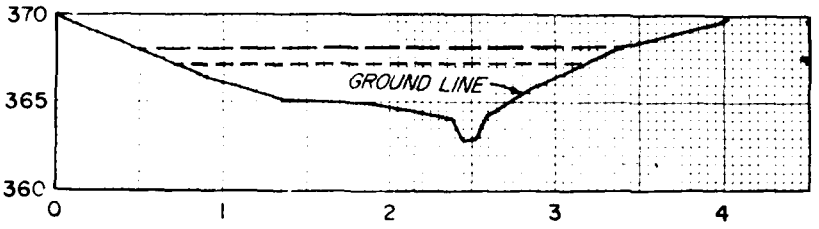


CROSS SECTION NO. 5
MILE 1.10

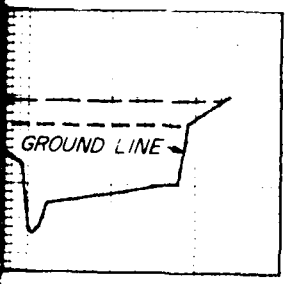
HORIZONTAL DISTANCE IN HUNDREDS OF FEET



CROSS SECTION NO. 6
MILE 1.50



CROSS SECTION NO. 7
MILE 1.91



ROSS SECTION NO. 4
MILE 0.72

LEGEND

——— Standard Project Flood

– – – Intermediate Regional Flood

NOTES:

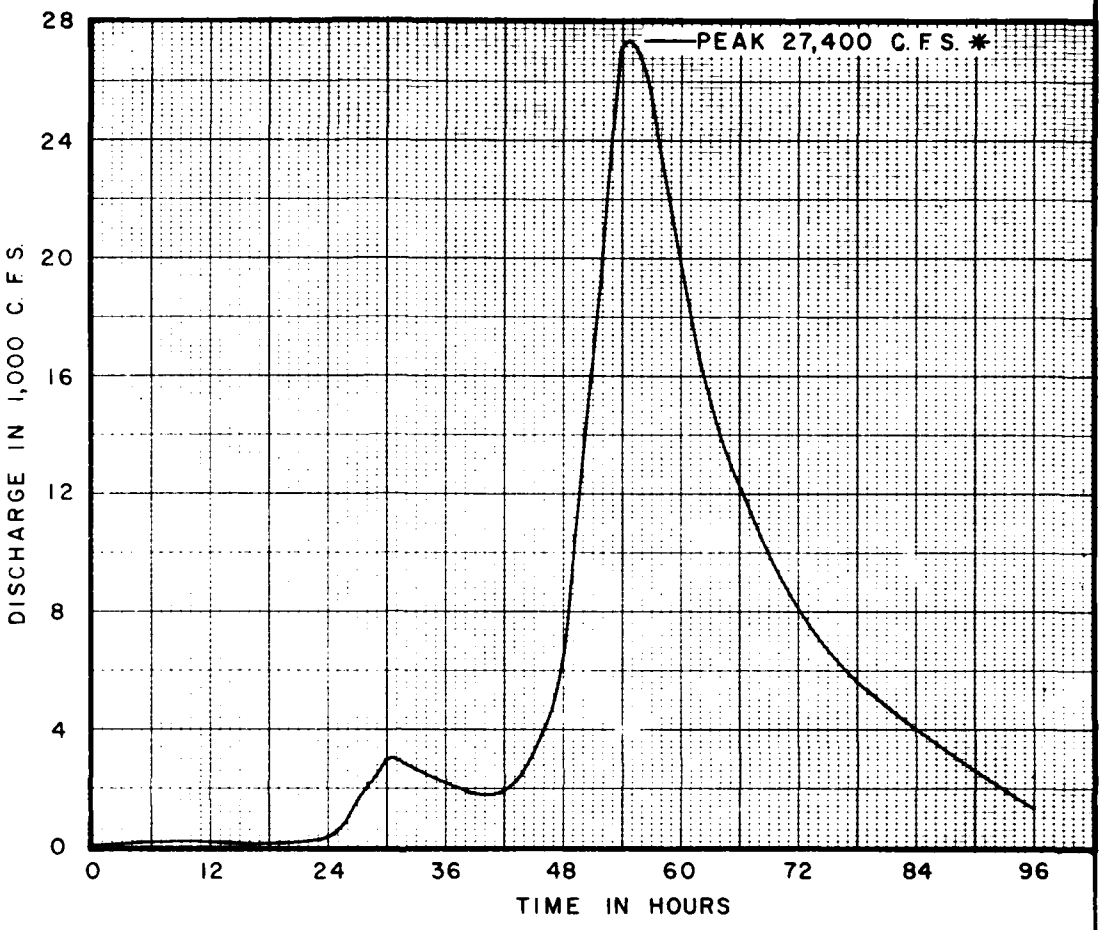
Sections taken looking downstream.

All sections for Little Cedar Creek shown.

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

FLOOD PLAIN INFORMATION
CITY OF ALLENTOWN
PENNSYLVANIA
CROSS SECTIONS
LITTLE CEDAR CREEK
OCTOBER 1972

PLATE 14



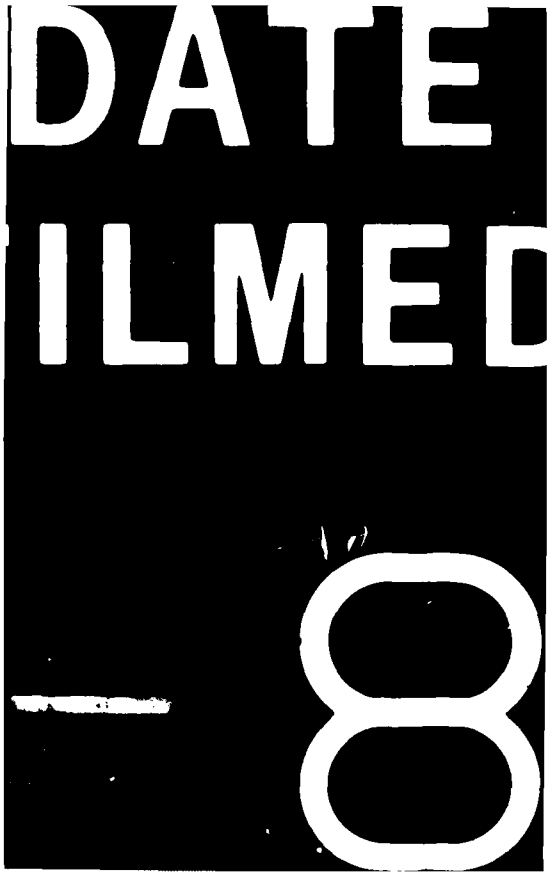
* LITTLE LEHIGH CREEK AT U.S.G.S. GAGE #4515
D.A. = 80.8 SQ. MI.

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

FLOOD PLAIN INFORMATION
CITY OF ALLENTOWN
PENNSYLVANIA
LITTLE LEHIGH CREEK
STANDARD PROJECT FLOOD HYDROGRAPH

OCTOBER 1972

PLATE 15


DATE
ILMED
8